1966
Lib
LIBRARY
JUL 22 1968
FISH & WILDLIFE SERVICE

REPORT OF THE

BUREAU OF COMMERCIAL FISHERIES

FOR THE CALENDAR YEAR

1966

United States Department of the Interior
Fish and Wildlife Service
Bureau of Commercial Fisheries

UNITED STATES DEPARTMENT OF THE INTERIOR
Stewart L. Udall, *Secretary*
David S. Black, *Under Secretary*
Stanley A. Cain, *Assistant Secretary for Fish and Wildlife and Parks*
FISH AND WILDLIFE SERVICE, Clarence F. Pautzke, *Commissioner*
BUREAU OF COMMERCIAL FISHERIES, H. E. Crowther, *Director*

REPORT OF THE

BUREAU

OF

COMMERCIAL FISHERIES

FOR THE

CALENDAR YEAR 1966

PIFSC LIBRARY

UNITED STATES GOVERNMENT PRINTING OFFICE
WASHINGTON • 1968

PIFSC LIBRARY

CONTENTS

	Page
INTRODUCTION	1
CONDITION AND TRENDS OF THE FISHERIES	4
DEVELOPMENTS IN THE FISHERIES	
Domestic fisheries	9
Atlantic calico scallop fishery	9
Atlantic surf clam fishery	9
Gulf of Mexico red snapper fishing	10
International tuna operation	10
Lake Michigan alewife fishery	10
Lake Michigan food fish fishery	11
Pacific hake fishery developments	11
Federal legislation	11
Control or elimination of jellyfish (sea nettles) and other such pests in the coastal waters of the United States	11
FPC (Fish Protein Concentrate) and authorization for demonstration plants	12
Fur Seal Act of 1966	13
Marine Resources and Engineering Development Act of 1966	13
National Sea Grant College and Program Act of 1966	14
12–mile fishery jurisdiction	14
International developments	15
Developments in foreign fisheries	15
Foreign trade	17
International meetings	18
International programs	19
Reporting on foreign operations	19
Treaty enforcement and foreign fisheries surveillance	19
ACCOMPLISHMENTS AND OPERATIONS	
Principal accomplishments	20
North Pacific	20
Alaska bottomfish explorations	20
Alaska pink shrimp	20
Alaska shrimp studies	21
Alaska Stream investigation	21
Budworm control	21
Columbia River Fishery Development Program	21
Columbia River water quality research	23
DDT contamination in Alaska	23
Driftcard invention	24
Fish tag tests	24
Fishery product containers	24
King crab research	24
Naknek River water movement tracked	24
Pacific hake explorations	25
Pacific hake studies	25
Pacific ocean perch	25
Pribilof Islands fur seal industry	25

Page

Salmon abundance forecast 26
Salmon distribution in the Aleutian chain 27

California 27
Anchovy fishery 27
Costs and earnings of tuna seiners 27
Fish cookery and handling 28
Marine fish culture 28
Oceanographic data collection 29
Plankton sampling gear 29
Purse seine design and construction of a model 29
Sonar equipment 30

Hawaii 30
"Oceanographic Atlas of the Pacific Ocean" 30
Tuna studies 30

Gulf of Mexico 31
Harvesting fishes for industrial use 32
Market development of underutilized species 32
Shrimp harvesting 32
Shrimp studies 33
Unutilized and underutilized fish resources 33

Atlantic 34
Bermuda deep–sea fishes 34
Data exchange system 34
Environmental studies in New England 35
FPC (Fish Protein Concentrate) 35
Fish Systematics Program 35
Fishes of South Atlantic States 35
Groundfish and sea scallops 36
Irradiation preservation of fish 36
Maps of the Middle Atlantic Continental Shelf 37
Menhaden studies 37
Oyster culture in salt–water ponds 37
River herring 38
Shellfish farming 38
Shellfish mortality 38
Shellfish selective breeding 39
Surf clam survey 39
Swordfish and tuna explorations 39
Tropical Atlantic fishes and environment 40
Tuna studies 40
Woods Hole Aquarium 40

Great Lakes 40
Alewife fishery 41
Lake Michigan fish populations 41
Lake Superior commercial fishing industry study 41
Missouri River reservoirs 41
Sea lamprey control 42

CONTENTS—(CONTINUED)

	Page
General	42
Commercial Fisheries Research and Development Act of 1964	43
Cooperatives	43
Economic situation and outlook reports	44
Exploratory fishing in fresh water	44
Fishery product publicity	44
Fishery statistics	45
Inspection and certification program	45
Market News Service reporting	46
Marketing cooperators sought	46
National Anadromous Fish Program	46
Oil and gas activities	47
Pesticide surveillance	47
Pollution studies	47
Smoked fish research	47
Standards and specifications for fishery products	48
Survey instrument development	48
Transportation of fishery products	48
Water resource developments	49
Fisheries financial assistance programs	51
Fisheries Loan Program	52
Fishing Vessel Construction Differential Subsidy Program	52
Fishing Vessel Mortgage and Loan Insurance Program	52
American Fisheries Advisory Committee	53
New Programs	53
Analysis to determine optimum shrimp fishing effort in zones in the Gulf of Mexico	53
Anchovy studies	54
EASTROPAC	54
Economic analysis of the relative efficiency of certain fishing vessels	55
Economic feasibility of establishing a fish block industry in the Pacific Northwest and Alaska	55
Harvesting Pacific Northwest pelagic fish	56
Man–in–the–Sea Program	56
Missouri River tailwater studies	56
Planning, Programming, Budgeting, and Evaluation System	56
Salmonid loss assessment	57
Spacecraft oceanography	58
Techniques for successful fish farming	58
Meetings	58
Canadian Atlantic Offshore Fishing Vessel Conference	59
Eleventh Pacific Science Congress	59
Fisheries Policing Conference, London	60
Food and Agriculture Organization of the United Nations	60
Committee on Fisheries session	60
Council session	61
Great Lakes Fishery Commission	61
Gulf and Caribbean Fisheries Institute	62

Page

Indo–Pacific Fisheries Council 62
Inter–American Tropical Tuna Commission 63
International Commission for the Northwest Atlantic Fisheries 64
Annual meeting 64
Working Group meeting 65
International Convention for the Conservation of Atlantic Tunas. 65
International Council for the Exploration of the Sea 66
International Labor Organization 66
International North Pacific Fisheries Commission 67
International Pacific Halibut Commission 67
International Pacific Salmon Fisheries Commission 68
International Whaling Commission 68
North Pacific Fur Seal Commission 69
UN/FAO Caribbean Fisheries Development Project Liaison Officers Meeting 69
Cooperation and coordination with international, Federal, State, and other agencies 70
Cooperation with international groups 70
Cooperation with Codex Alimentarius Commission 70
Cooperation with United Nations 71
Foreign Currency Research Program 71
Cooperation with Federal agencies 71
Cooperation with Atomic Energy Commission 72
Cooperation with Economic Development Administration 72
Cooperative Observance Program 73
Training program assistance to Agency for International Development 74
Cooperation with States 74
Cooperation with other groups 74
Organization, employment, budget, and physical properties 74
Organization 75
Employment 75
Budget 77
Physical properties 77
Publications 87

APPENDIXES

A. Fisheries of the United States 88
B. New legislation 91
C. Fisheries loan fund 95
D. American Fisheries Advisory Committee membership, 1966 97
E. Organizations with which the Bureau had research and development contracts and grants in 1966 98
F. Budget for fiscal year 1966 100
G. Physical properties 101
H. Fish and Wildlife Service publication series and a 1966 list of publications by Bureau personnel 106

Frontispiece.--Regional and area boundaries, Bureau of Commercial Fisheries, December 31, 1966.

Frontispiece.—Regional and area boundaries, Bureau of Commercial Fisheries, December 31, 1966.

Report of the Bureau of Commercial Fisheries for the Calendar Year 1966

This tenth annual report of the Bureau of Commercial Fisheries is made in compliance with Section 9(a) of the Fish and Wildlife Act of 1956. This Act created the U.S. Fish and Wildlife Service, which comprises the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife.

Information on projects undertaken in 1966 under the Saltonstall–Kennedy Act of July 1, 1954, is combined with other activities in this report for the first time; in previous years the Saltonstall–Kennedy projects were reported separately.

The United States in 1966 dropped from fifth to sixth place among the fishing nations of the world, being topped by Norway by a small margin. The United States ranked second for many years, but declined to third place in 1957–59, and to fifth place in 1960–65, falling behind Peru, Japan, Communist China, and U.S.S.R. Although the harvest of fish from the waters of the world has about tripled since World War II, the U.S. year–to–year catch has not varied greatly.

Even more, our fishing fleets are becoming obsolescent when compared with the modern fleets of Japan, the U.S.S.R., Great Britain, West Germany, and Canada.

The United States should be the leading fishing nation of the world because it has all the qualifications for this position. It has adequate resources on the broad Continental Shelves of its long coastlines to support a modern high–seas fishery. It also has markets for fish and fishery products and highly skilled fishermen, scientists, and engineers.

As a conservative estimate, nearly 20 billion pounds of fish could be harvested off our coasts on a sustainable yield basis. They are

there—crustaceans, mollusks, herring, anchovy, cod, and hake—on our Atlantic and Pacific Coasts. West across the North Pacific from our shores, off the Bering Sea Coast of Alaska, and off Central and Southeastern Alaska, fleets of foreign vessels are fishing with increasing intensity for these resources that are within easy range of our fishing fleets. Foreign fleets also fish in the nearby waters of the Gulf of Mexico, Caribbean Sea, and the North Atlantic.

The U.S. market for fish and fish products exceeds its supply. The overall U.S. supply of fish has increased steadily in recent years and at the present time exceeds 12 billion pounds. Our use of fish and shellfish increased from 7.6 to over 12 billion pounds, or 64 percent during the past 10 years. To meet the needs, 65 percent of our supply of fish and shellfish in 1966 was imported.

The skills of U.S. fishermen, scientists, and engineers are outstanding. Given good equipment, the U.S. fisherman does an excellent job. U.S. scientific knowledge is second to none, and U.S. engineering skills have produced the most technologically advanced society the world has ever known. For these reasons, we would expect our fisheries to be growing markedly.

Many reasons have caused the sluggish growth of the U.S. fishery. Profits in the fish-catching side of the business have been too small to encourage investment. With its present vessels and gear, the United States has not been able to catch fish and market them as cheaply as its competitors, who have taken many of our markets. They produce fish cheaper than the United States does because they have lower labor costs, direct government assistance, and the most modern vessels and gear. Another cause for the U.S. lag is selective fishing. In the Pacific Northwest, for example, U.S. fishermen have been preoccupied with salmon and halibut and have paid little attention to other abundant and valuable species. Also, regulations that favor inefficient fishermen handicap the inventive, aggressive fishermen.

The tide, however, is beginning to turn in favor of the U.S. fishery. Costs of all kinds, including labor, are increasing in many parts of the world at a more rapid rate than those in the United States. With the recent advent of the fishing vessel construction law in the United States, initial capital investment in vessels and gear has been largely equalized, and U.S. fishermen will be able to start on an even basis with their competitors. As a result, in some parts of the United States a boom in modern fishing vessel construction has begun. In New England, for example, new vessel construction has been stimulated greatly—

it has been decades since so many vessels were being built. Furthermore, new profits are being realized from investments in the fisheries. Fishermen's unions are helping also by sponsoring training courses. Foreign markets also are opening up everywhere for U.S. fishery products. North Europe is eating fresh, frozen, and canned fish as never before. Developing nations in Africa and Asia are becoming aware of the advantages of high-quality protein sources from the sea. These developing markets are attracting fish that has been exported to the United States in recent years, thus leaving our markets to our own fishermen.

Many other things can be done for the U.S. fishery. The handicaps of discriminating restrictions against our fishermen and regulations designed only to favor one group of fishermen over another must go. A premium must be placed on efficiency, not on inefficiency. This will lower the cost of production.

Desperately needed are new and modern fishing vessels capable of venturing farther to sea and properly preserving large catches.

Cooperation is also needed. Fishermen, boatowners, processors, and the Federal Government need to work together as never before to see that the highest quality, lowest price, and greatest variety of products reach the market and capture a larger part of the consumer dollar.

This annual report provides an account of some of the more important activities that the Bureau carried on in 1966 in its efforts to promote the interests of the U.S. fishery.

The Bureau studied the biology and ecology of commercially important inland, marine, and anadromous fishes, shellfish, and mammals to obtain information on causes of variations in abundance, to develop methods for obtaining optimum sustained yields of fishery resources, and to improve cultural practices and operations.

Other activities concerned the economics of the fisheries. The Bureau performed research on assessing, developing, and increasing the economic use of fishery resources, analyzed various economic aspects of production, distribution, and consumption of fishery products as required by various statutes, including the Fish and Wildlife Act of 1956 and other laws; carried out its responsibilities under the Fishery Cooperative Marketing Act of 1934 and its responsibilities for improving transportation facilities and rates for fish and shellfish and any products thereof; promoted the legitimate interest of the fishing industry in domestic and international economies to a degree commensurate with the Bureau's public responsibilities; furnished advice, reports, and con-

sultation services to other Government agencies, Congress, and the general public; developed Bureau-sponsored legislation, in accord with established policy, which was designed to resolve fundamental economic problems of the industry; and provided a market news service that collected, analyzed, and published current information and statistics on fishery commodities.

The Bureau made other studies to improve the welfare of U.S. fisheries. It investigated methods to improve and develop the catching, handling, processing, storing, transporting, and marketing of fishery products; determined the composition, properties, and nutritive value of fishery products; developed and improved methods of fish cookery; improved or corrected sanitation practices and plant operations through advisory and inspection services; performed exploratory fishing to determine the character, extent, and availability of resources; tested, devised, and demonstrated the most effective types of gear and vessels; assisted the industry in solving problems of production, distribution, and consumption so that markets for domestic fishery products could be increased; provided an educational service to promote the free flow of domestic fishery products in commerce; and prepared working documents, position papers, and reports on foreign and domestic fisheries; and administered the fishery attaché and foreign fishery reporting program.

Still other activities of the Bureau in 1966 were supervision of a fisheries loan program, a fishing vessel mortgage and loan insurance program, and a fishing vessel construction differential subsidy program; supervision of the Columbia River fishery development program, in cooperation with State agencies; coordination and reporting on water resource development activities that affect commercial fishing; design and inspection of fish protective devices; management of fur seals in the North Pacific; and implementation of laws and regulations on the management of commercial fisheries, whales, and seals, pursuant to international agreements.

Condition and Trends of the Fisheries [1]

The year was a good one for the U.S. commercial fisheries. More vessels entered the fisheries in 1966 than in any year since the postwar years of the late 1940's and early 1950's. Although landings were down, the value of the catch, over $454 million, was up nearly $9 million from the previous year. With few exceptions,

[1] Data are preliminary.

prices to fishermen were significantly higher than in 1965. Although the catch of shrimp was less, the value was nearly $96 million—the first domestic fishery to approach the $100 million ex-vessel value. Tuna prices were up early in the year and were at a comparatively high level to the end of 1966. Compared with 1965, average tuna prices increased about $56 per ton for albacore, $32 for bluefin, $56 for skipjack, and $82 for yellowfin. The increase in tuna value reflected the increasing demand for this popular seafood. The U.S. pack of canned tuna reached a record volume and value in 1966. The year ended with prices of fish and shellfish received by fishermen about 16 percent above the 1957–59 average, seasonally adjusted. In comparison, the index of prices received by farmers for meat animals was up about 5 percent.

The 1966 U.S. commercial catch of 4.3 billion pounds represented a decline of 400 million pounds from the 4.8 billion pounds in 1965. Species showing the greatest decline were menhaden, tuna, sea herring, jack and Pacific mackerel, shrimp, scup (porgy), and to a lesser extent Atlantic flounders, blue crab, mullet, oysters, Atlantic sea bass, sea scallops, and Atlantic ocean perch. Significantly greater catches of salmon (the biggest catch in 17 years), California anchovies, king crab, and to a lesser degree, bonito, Dungeness crab, whiting, and alewives partially offset the decline. The catch of other important species—haddock, halibut, Atlantic cod, clams, and northern lobsters—did not vary greatly from that of 1965. The average price of these species was higher than that for the previous year.

The menhaden season was the poorest in many years—1.3 billion pounds valued at $22 million, 416 million pounds and $5 million less than in 1965. One exception was in North Carolina where a run of very large fish in November and December prevented what might otherwise have been a low production year for that State.

The catch of salmon, 405 million pounds, valued at $67 million, was up 78 million pounds and $2 million from that of the previous year and was the greatest catch since 1949. Pink salmon accounted for most of the increase (up 98 million pounds and $8 million) followed by chum or keta, and silver or coho. The catch of red or sockeye salmon was down 48 million pounds and $11 million. Landings of chinook (king) decreased 3 million pounds and about one-half million dollars.

Shrimp landings in 1966 were 9 million pounds less but $13 million greater than those for the previous year when the catch was nearly 244 million pounds valued at $82 million. Landings at ports in southern States, 201 million pounds, were down 20 mil-

lion pounds. Landings in Pacific and New England States increased 11 million to nearly 34 million pounds. The catch taken in international waters off foreign coasts in the Gulf of Mexico and the Caribbean decreased from over 28 million in 1965 to nearly 16 million pounds in 1966.

Tuna landings were down 51 million pounds but the value was up nearly $3 million from the 319 million-pound catch valued at about $42 million in 1965. The volume of skipjack, yellowfin, and albacore decreased 40 percent, 17 percent, and 4 percent, respectively. The bluefin catch was up 78 percent.

Blue crab landings were 6 million pounds lower than the 171-million-pound catch in 1965. The value was down $2 million. Production from Chesapeake Bay was up significantly, but a decline in the quantity taken in waters off southern States resulted in an overall decrease in the landings.

The king crab catch in Alaska of 159 million pounds, valued at $16 million, was a record and exceeded the previous high catch in 1965 by 27 million pounds. The ex-vessel prices did not vary greatly for the 2 years.

Haddock landings did not change significantly from the 134-million-pound catch in 1965; however, the value was up 3 percent. Significantly, the catch of scrod haddock was up 21 percent, and the larger size haddock was down 30 percent. These changes were due to the fishery's high dependence on the stock spawned in 1963. In 1965, smaller fish (scrod) made up about 56 percent and larger fish accounted for 44 percent of that year's catch.

A 7-million-pound drop in Atlantic flounders resulted in a 1966 catch of 127 million pounds. Decreased landings of yellowtail flounders, down 14 million pounds, were partially offset by a 6-million-pound increase in blackbacks. Landings of fluke and other flounders were only slightly greater than those in 1965.

Whiting (silver hake) landings of 90 million pounds were nearly 8 million pounds greater than those in 1965 but 43 million less than those for the record year in 1957. The average ex-vessel price in 1966 was 4.4 cents per pound, up nearly 1.8 cents from the previous year.

The Great Lakes (Lake Michigan) catch of alewives increased to 29 million pounds from 14 million pounds, while the Atlantic catch decreased to 54 million from nearly 65 million pounds in 1965, resulting in an overall increase of about 4 million pounds in 1966.

The catch of Atlantic ocean perch decreased 2 million pounds to 81 million pounds from 1965—the smallest catch since 1939 and

only about one-third of the 258 million pounds landed in 1951, a record year.

Sea herring landings of 81 million pounds were down 26 percent from those in 1965. The catch in the Pacific Ocean dropped from 35 to 14 million pounds. The Atlantic Ocean catch decreased from 76 to about 68 million pounds.

The Atlantic production of hard, soft, and surf clams was 15, 12, and 45 million pounds of meats, respectively, with a combined value of $18 million to fishermen—slightly greater than that in 1965.

Compared with that of 1965, the California catch of jack mackerel was down 26 million to 41 million pounds and Pacific mackerel decreased 4 million to nearly 3 million pounds in 1966. The average annual California catch for the 5 years 1960–64 was 90 and 39 million pounds for jack mackerel and Pacific mackerel, respectively.

The oyster harvest, 50 million pounds of meats valued at $26 million, was less than that for 1965 when production was 55 million pounds with a value to fishermen of $28 million.

Although the 1966 Pacific halibut season was the shortest in recent years, the U.S. catch of 40 million pounds was slightly less than that for the previous year. In contrast, the Canadian catch was up over 1 million pounds from that of the previous year. A greater number of vessels operated in the United States and Canadian halibut fleet than in 1965. U.S. landings of halibut at Seattle were at a new low—3 million pounds less than those in 1965. Ex-vessel prices were high. The sustained high prices in Alaska induced many vessels to land their trips there instead of returning to Washington ports.

Landings of anchovies in California increased to 60 million pounds from 6 million in 1965. Lifting restrictions and establishing quotas by that State resulted in greater landings of this species.

Atlantic cod landings, nearly 37 million pounds, were only slightly greater than those in 1965, but 17 percent lower than the average catch during the 5 years 1960–64. The ex-vessel price was up 0.5 to 8.5 cents a pound in 1966.

Mullet landings, 37 million pounds, were nearly 5 million pounds less than those in 1965. The average ex-vessel price did not vary greatly for both years.

The Dungeness crab catch, 37 million pounds, valued at $7 million, was up 28 percent in volume and 55 percent in value from

that of 1965. Lower landings in Alaska were offset by increased catches in the other Pacific Coast States.

The northern lobster catch of nearly 30 million pounds was down less than 1 million pounds from that of 1965. The average ex-vessel price was up 6 percent to 77 cents a pound.

Scup (porgy) landings at Atlantic ports have gradually decreased since the peak year catch of 49 million pounds in 1960. The poundage in 1966 was 27 million, down from 36 million pounds in the previous year. Fishermen, however, received about the same value for the catch each year.

The sea scallop fishery, in contrast to other fisheries, had a poor year both in volume and price. Production of edible meats was nearly 17 million pounds valued at $8 million. Landings were 17 percent less than those for the record year in 1965. The price per pound was down about 30 percent.

The bonito catch of over 14 million pounds was significantly greater than the 6 million pounds landed in 1965 and the average annual catch of nearly 4 million pounds in 1960–64. Landings in 1966 established a record for this species.

Atlantic sea bass landings of nearly 5 million pounds was 46 percent less than those during 1965 and was off 40 percent from the average annual catch in 1960–64. The ex-vessel price increased 27 percent from 11.5 cents a pound during the previous year.

Imports of fishery products (round weight) established a record in 1966—2.3 million pounds greater than those in 1965 and exceeded the previous high of 7.5 billion pounds in 1964 by over 600 million pounds. Compared with those of the previous year, edible commodities were up 11 percent and fishery industrial products increased 65 percent. Imports of groundfish fillets and ocean perch (including blocks) were 315 million pounds, and fillets of miscellaneous species were 93 million pounds — both established records for the year. Canned sardines (including herring), 67 million pounds, were 2 million pounds more than those for the record year 1962. Imports of fresh and frozen tuna were a record 307 million pounds. Shrimp, 195 million pounds (heads-off basis), was a record, as was scallop meats—17 million pounds. Fish meal imports, 448,000 tons, were up 177,000 tons from 1965 and 9,000 tons above the record year 1964.

The U.S. supply (domestic catch and imports) of fish and shellfish (round weight basis) was a record 12.4 billion pounds—products for human food made up 44 percent and for nonhuman food (principally animal feed) 56 percent. On a per capita basis,

the U.S. supply (round weight) of fish and shellfish was up from 55 pounds in 1965 to 64 pounds in 1966.

The per capita consumption of fishery products dipped to 10.6 pounds (edible weight), down 0.3 pound from 10.9 pounds in 1965. Consumption of fresh, frozen, and canned fishery products declined in 1966 but consumption of cured products held at 0.5 pound per person.

Developments in the Fisheries

Important developments in the fisheries in 1966 occurred in the domestic fisheries, Federal legislation, and international matters.

Domestic Fisheries

Among the developments in the domestic fisheries in 1966 were expansion of the calico scallop fishery of the southern Atlantic Coast, tests of a new type clam dredge to speed surf clam harvesting, improvement in vessels for the red snapper fishery in the Gulf of Mexico, improvement in methods for fishing tuna in the Equatorial Atlantic Ocean, construction of reduction plants for Lake Michigan alewives and conversion of tugs for catching these fish, conversion of vessels for fishing chubs and smelts in Lake Michigan, and explorations for Pacific hake in Puget Sound and off the Washington Coast.

Atlantic Calico Scallop Fishery

In December 1966 large catches were made on the calico scallop grounds off the U.S. southern Atlantic Coast, which were discovered by the Bureau's Exploratory Fishing Base at St. Simons Island, Ga. Seven to ten vessels fished 5 days a week; each vessel landed 500 to 600 bushels of scallops a day at Morehead City, N.C. Tests of the industry-developed mechanical scallop shucking equipment to process part of the catch were not entirely successful. When this equipment is improved and adopted, the fishery may be extended to other areas where high costs of shucking by hand now make the fishery unprofitable.

Atlantic Surf Clam Fishery

The Bureau's Exploratory Fishing Base at Gloucester, Mass., in 1966 advised a clam cannery in Wildwood, N.J., concerning a submersible, air-lift pump to be used on a clam dredge. This pump will speed up harvesting of sea clams off New Jersey and Delaware. It delivers large sea clams through a 12-inch rein-

forced-rubber hose to the deck of the clamming vessel. This dredge is an improvement over the conventional gear because it can be towed continuously over clam beds at depths to 120 feet without having to be hauled to the vessel deck to discharge the clams.

Gulf of Mexico Red Snapper Fishing

The first of a series of steel refrigerated vessels built for fishing red snapper on grounds off Honduras and Nicaragua began operating late in 1966. It made two trips to red snapper areas that had been found by the Bureau's Exploratory Fishing Base at Pascagoula, Miss. This vessel, the privately owned *Highliner*, landed 69,000 pounds of snappers—30,000 in the first trip and 39,000 in the second. Frozen in individual polyethylene bags, the snappers were in excellent condition and sold immediately when the vessel returned to port.

International Tuna Operation

The Bureau's Exploratory Fishing Bases at Gloucester, Mass., and Pascagoula, Miss., assisted a U.S. company that operates a tuna cannery in Puerto Rico. The Bases gave information about the operation of longline gear and the availability of tuna in the Atlantic. Two of the three Japanese longline vessels that the company bought for tuna fishing in the Equatorial Atlantic Ocean began fishing in 1966 off West Africa. The third vessel was reportedly en route from South Korea late in 1966. The vessels are documented in Panama and carry a crew of South Korean fishermen and three Japanese fishing experts.

Lake Michigan Alewife Fishery

The Bureau's Exploratory Fishing Base at Ann Arbor, Mich., advised the Lake Michigan alewife industry concerning plant layout and vessel conversion. The 1966 alewife catch was almost 30 million pounds—almost double that of 1965. A second new fish reduction plant was completed in the Green Bay area of Lake Michigan in April, and construction of a new one was begun in November. The second plant raised daily reduction capacity to 450 tons of whole fish, and the third is expected to increase the capacity to 600 tons.

Two additional gill net "tugs" were converted to trawlers to catch alewives for these reduction plants. A third "tug" was converted by a new type of alteration—its length was increased by 15 feet and the vessel was repowered with a larger engine.

Lake Michigan Food Fish Fishery

The Bureau's Exploratory Fishing Base at Ann Arbor, Mich., gave technical assistance to two trawlers that were converted from gill net vessels. The boats fished for food fishes—chubs and smelt —under a contract with EDA (Economic Development Administration). Trawlers can fish almost year-round. Fishing for chubs and smelts was previously confined to the spawning period of about 4 weeks, when they were caught in fixed pound nets. The two vessels are expected to continue trawling after the EDA contracts are completed.

Pacific Hake Fishery Developments

Pacific hake is a species that has been underutilized, and the Bureau has stimulated hake fishing in Puget Sound and off the Washington Coast. Cooperation of industry and the Bureau stimulated the Puget Sound reduction fishery which began late in 1966. Under cooperative agreements, the Bureau provided commercial vessels with special *Cobb* pelagic trawls and depth finders. During the 1965–66 season the vessels caught over 6 million pounds of hake. This fishery is expected to yield 10 to 20 million pounds of hake annually.

The Bureau's Exploratory Fishing Base at Seattle, Wash., began commercial fishing operations on hake populations off the Washington Coast in July 1966, and a new reduction plant at Grays Harbor was opened. A large fleet of U.S.S.R. trawlers fishing for hake with large otter trawls arrived soon after the U.S. fishery began. The U.S.S.R. catch was estimated at 220 million pounds; U.S. production was only about 4 million pounds. The future of the U.S. hake fishery may depend upon the ability of U.S. fishermen to compete on fishing grounds with foreign fleets.

Federal Legislation

In 1966 the Congress passed six acts affecting the U.S. fishing industry (app. B). A summary of each act follows.

Control or Elimination of Jellyfish (Sea Nettles) and Other Such Pests in the Coastal Waters of the United States

The Act of November 2, 1966, authorizes the Secretary of the Interior to cooperate with and help the States and the Commonwealth of Puerto Rico to control and eliminate jellyfish and other such pests and to study how to control floating seaweed in such waters. This Act authorizes appropriation of funds for the

Federal share for fiscal years 1968, 1969, and 1970 on an increasing scale of $500,000, $750,000, and $1,000,000, respectively. The sea nettle or common jellyfish of Chesapeake Bay has become a growing source of physical and psychological irritation to residents and visitors alike. Its presence discourages swimmers and waders, who go elsewhere for recreation. The jellyfish, therefore, has a major impact on the recreation industry, which is economically important because more people are turning to water-related recreation.

FPC (Fish Protein Concentrate) and Authorization for Demonstration Plants

The Act of November 2, 1966, authorizes the Secretary of the Interior to develop economical processes for producing FPC from unutilized and underutilized species of fish. The Act authorizes him to conduct and promote research for this purpose through grants to and contracts with private agencies. The Secretary may construct one experimental and demonstration plant for producing FPC and may lease one additional plant for such purpose. Construction or lease will be delayed until the Secretary of Health, Education, and Welfare has certified that FPC produced from whole fish complies with provisions of the Federal Food, Drug, and Cosmetics Act.

The Act authorizes appropriation of $1,000,000 for constructing one plant and $1,555,000 annually for 5 fiscal years beginning with fiscal year 1968 for leasing one demonstration plant, operating both plants, and conducting programs authorized by the Act.

Since 1961 the Bureau has been engaged in research and development of FPC. The product is inexpensive, stable, and wholesome, with high nutritive quality. It is a powder that is hygienically prepared from whole fish. Considerable progress has been made in the development of FPC. Bench-scale experiments that involved a few ounces of raw material have been superseded by tests in a model-scale unit that processes many hundreds of pounds of raw fish.

Pilot plant operations now are necessary for several reasons. A number of engineering concepts must be tested. The fishing and processing industries must be shown that the manufacture of FPC is practical and that the product has many uses. Sufficient quantities of FPC are needed for large-scale tests of feeding and storage. Feasibility studies must be made of the feasibility of creating and developing markets for FPC-supplemented foods. The Congress passed this Act to meet these needs.

Fur Seal Act of 1966

The Act of November 2, 1966, supersedes the Fur Seal Act of 1944 and further implements the Interim Convention on the Conservation of North Pacific Fur Seals, signed February 9, 1957, and amended by the Protocol signed October 8, 1963.

The Act of 1966 authorizes the Secretary of the Interior to conserve and manage the North Pacific fur seals, to administer the special reservation of the Pribilof Islands, and to protect sea otters on the high seas. The Act further authorizes the Secretary to transfer real and personal property to the native population and to create a townsite with provision for local self-government. It is hoped that development of the social, economic, and political life of the resident Aleuts can parallel that of other U.S. citizens who choose to live on Government reservations.

The Pribilof Islands, in the Bering Sea about 300 miles off the Alaska Coast, are a special Government reservation set aside in 1869 for protection and management of the Alaska fur seal herd. Under provisions of the Fur Seal Act of 1944, as amended (16 U.S.C. 631a–631q), the Secretary of the Interior, through the Bureau of Commercial Fisheries, administers these Islands to protect the fur seal herd and harvest the skins. He also provides for the welfare of about 650 Aleut natives who reside permanently on St. Paul and St. George Islands.

The Interim Convention on Conservation of North Pacific Fur Seals signed February 9, 1957, was amended by a Protocol dated October 8, 1963. This amendment plus progress made in the past several years in placing the resident Aleuts on the same basis as other citizens and Federal employees created a need to update the 1944 Act. Congress responded by enacting the Fur Seal Act of 1966.

Marine Resources and Engineering Development Act of 1966

The Act of June 17, 1966, establishes the National Council on Marine Resources and Engineering Development. The Council is at the Secretarial level with the Vice President as Chairman. The Act also establishes a 15-member Commission that the President appoints from Federal and State Governments, industry, universities, laboratories, and other institutions engaged in marine, scientific, or technological work. Four Congressmen are appointed as advisory members.

The Act contains a Congressional declaration of policy for a coordinated, comprehensive, and long-range program in oceano-

graphic and scientific endeavors, engineering and technology with relation to the oceans, the Continental Shelf, the Great Lakes, and the seabed and subsoil of the submarine areas adjacent to coasts of the United States.

Through efforts of the Council and the Commission an examination will be made of what is now being done in this area, what should be done, and recommendations for the best way to do it. The Council and the Commission will be abolished when they have completed their task.

This Act is a crystallization of the effort of many Federal agencies that are engaged in some phase of ocean science and oceanography. The importance of the oceans and their resources has received increasing attention, and Congress recognized the need for a comprehensive, long-range program in oceanography.

National Sea Grant College and Program Act of 1966

The Act of October 15, 1966, amends the Marine Resources and Engineering Development Act of 1966. Its purpose is to improve the Nation's capability to obtain and use natural resources of the oceans. It will achieve this goal through a program of financial support to institutions of higher education and other institutions concerned with development of marine resources. The Act will assist in research, development, and applied work necessary to learn how to use the oceans by following the same concepts that have been applied to use of the land. The Act will create an expanded capability for training scientists, technicians, engineers, and others needed to locate, harvest, and use the ocean's resources. The Act will also encourage the development of programs of practical demonstration that sea grant colleges and other institutions can use. The programs plus pertinent publications will provide useful information to persons engaged in development of marine resources, to the scientific community, and to the general public.

12-Mile Fishery Jurisdiction

The Act of October 14, 1966, extends the United States' exclusive fisheries jurisdiction to a 9-mile zone contiguous to the United States' 3-mile territorial seas, subject to continuation of traditional fishing by foreign states within the 9-mile zone as may be recognized by the United States. The Congress has made it clear that this Act does not extend jurisdiction of the several coastal States to the natural resources beneath and in the waters of the 9-mile fisheries zone or diminish their jurisdiction to such

resources beneath and in the waters of the 3-mile territorial seas of the United States.

The Congress passed this Act because foreign fishery activity off coasts of the United States has increased greatly in recent years. Large, integrated foreign fleets are now fishing in waters that Americans alone have fished for generations. Certain segments of the U.S. fishing industry asked that the fishery jurisdiction of the United States be expanded. During this same period the trend has been toward establishment of a 12-mile fisheries rule in international practice. Many countries acting individually or in concert with other countries have extended their fisheries limits to 12 miles. Because of these developments in international practice, it became clear that an extension of the United States' exclusive jurisdiction of 9 miles beyond the territorial sea would not be contrary to international law.

International Developments

Developments in foreign fisheries, like those in U.S. fisheries, greatly affect our fishing industry, policies, and programs. The great success of foreign countries in finding high-seas fishery resources and world markets handicaps our fishing industry. To help the industry solve these problems, U.S. delegates discussed the king crab fishery in the eastern Bering Sea with Japanese delegates, and conservation and use of fishery resources off U.S. coasts with U.S.S.R. delegates. To find foreign markets for U.S. fishery products, the Bureau participated in trade negotiations and sent representatives to international trade fairs. The Bureau also participated in international meetings and programs and obtained information on foreign fisheries and assessed their impact on our fishing industry, policies, and programs. The Bureau also helped enforce treaties made at previous international meetings.

Developments in Foreign Fisheries

The world record catch of 57.7 million short tons was established in 1965 and continued the upward trend that began in the early 1950's. Complete data for the 1966 world catch are not available yet; however, it appears that for the 17th consecutive year world fishery production has increased and set a new record. Increased fishery activities of Japan, Peru, Norway, and U.S.S.R. have contributed to the greater world catch. During this time, however, the U.S. catch has increased more slowly than the world catch. The United States, therefore, has dropped from second to sixth place

among the leading fishing nations of the world. Peru, Japan, Communist China, Norway, and U.S.S.R. are ahead of the United States in volume of catches.

United States and Japanese delegations discussed in Washington, D. C., November 14 to 18, 1966, the Japanese king crab fishery in the eastern Bering Sea. The delegations agreed to recommend to their respective Governments an extension for another 2 years of the November 1964 agreement. There is one exception: the annual Japanese king crab catch for 1967 and 1968 would be set at the equivalent of 163,000 cases to avoid possible overfishing. The Japanese catch for 1965 and 1966 was the equivalent of 185,000 cases. The delegations also agreed to recommend further intensification of the study on the king crab resource in the eastern Bering Sea and presentation of the research results to the International Commission under the North Pacific Fishery Commission.

Fishery experts of the United States and the U.S.S.R. concluded a week of technical discussions July 30, 1966, in Moscow on problems relating to conservation and use of fishery resources off the U.S. coasts. The two delegations agreed to recommend to their respective Governments certain measures to alleviate the short-term problems and to establish procedures looking to long-term solutions.

Among the recommendations was a proposal that scientific and technical experts of the two countries meet again in Moscow to consider further problems of conservation and rules governing fishing vessels on the high seas off the Pacific and Atlantic Coasts of the United States. This meeting would be followed by another meeting of representatives of the two Governments to consider the conclusions of the scientists and technicians and to decide on further measures that were proposed.

The delegations agreed to recommend that exchanges of fishery personnel aboard fishing and research vessels of the two countries in both the Atlantic and Pacific areas be started within a month. U.S. participants in the exchanges would probably include scientists, fishery management experts, and representatives of the fishing industry.

It was also recommended that the U.S.S.R. Government take action to ease problems arising out of concentrations of vessels on fishing grounds customarily used by American fishermen. Immediate attention was to be given to the area off Oregon and Washington. A recommendation was also made that except for its research vessels the U.S.S.R. would not fish within 12 miles of the Washington and Oregon Coasts. The U.S.S.R. delegation agreed

that special instructions would be issued to the U.S.S.R. fleet in this area.

The delegations also noted problems that had arisen in the Shumagin Islands area of Alaska where conflicts between fishermen of the two countries arose from their use of different types of fishing gear. It was decided that these problems should be handled within the framework of an existing agreement between the two countries governing similar gear problems in the Kodiak area.

United States and U.S.S.R. fishery scientists who met in Moscow November 10 to 25, 1966, assessed the condition of certain fish stocks harvested by U.S.S.R. and U.S. fishermen in the Pacific Ocean, primarily off the Oregon and Washington Coasts, and in the Atlantic Ocean off the mid-Atlantic States. The talks also dealt with navigational and other technical problems caused by the appearance on fishing grounds of many different-sized vessels using differing fishing methods. The scientists identified several categories of technical and navigational problems and various possible means for dealing with them.

Foreign Trade

Bureau staff members analyzed data on foreign trade in fishery products to determine how changes in import and export trade affect the U.S. fishing industry. They participated also in the work of interagency committees that consider various problems involved in fishery product tariffs and trade in connection with Kennedy Round negotiations.

During 1966, the value of U.S. imports of fishery products was about $723 million, a gain of 20 percent over the previous record year of 1965. The value of fishery exports was nearly $100 million, a gain of 25 percent. Exports in 1966 increased 66 percent in value over the previous 5-year average.

To expand Western Europe markets for U.S. fishery products, the Bureau's Office of International Trade Promotion participated in six 1966 foreign food trade shows. One was a strictly U.S. food products display at the U.S. Trade Center in Milan, Italy. The other five shows were international trade fairs in London and Manchester, England; Vienna, Austria; Munich, Germany; and Paris, France. Twenty-six U.S. firms participated in one or more of these shows.

Actual sales as reported by industry averaged $100,000 per show, and projected sales for 1967 are expected to exceed $5 million. Most of the orders were for expensive, high-quality species, such as Alaska king crab, lobsters, shrimp, salmon, and pasteurized crab

meat. These sales for dollars will help to correct the import–export imbalance.

Some products successfully introduced to European markets for the first time were pasteurized blue crab meat, whitefish caviar, frozen Maine lobsters, IQF (individually quick frozen) frozen bay scallops, breaded softshell clams, and frozen shrimp cocktail.

The highlights of the American food exhibits at Vienna, Munich, and Paris were the attractive displays of fresh fish and shellfish. Many of the species, such as Dungeness crab, pompano, and Spanish mackerel, are not available in Western Europe. A U.S. carrier flew samples of fresh fish (free of charge) at 3–day intervals from the Northwest, Northeast, and Gulf of Mexico to these fairs.

Besides developing new markets, these fairs provide U.S. fish processors with direct exposure to a wide group of food merchants in foreign countries, an opportunity to find trained and available foreign representatives to handle their products, and experience in making necessary international contacts that are essential for increased exports.

To permit many diversified firms to promote and display their products overseas, the Bureau does not require them to have a company representative at their displays, but they must deliver their products to the show. Bureau personnel coordinate promotional activities at these shows and meet with potential importers, wholesalers, and distributors. They provide interested tradesmen with a brief questionnaire. The information obtained from the questionnaire is carefully compiled and distributed to each participating firm which then follows up on these leads. This method has been successful.

Personnel of the U.S. Department of Agriculture, the sponsor of international food fairs for 11 years, and the Bureau worked closely together in scheduling and putting on these international trade promotions. The Bureau's Branch of Marketing contributed also to the trade promotions by encouraging industry to send products that have a potential market in one or more European countries.

International Meetings

The more important 1966 international meetings that involved the Bureau and its personnel were those of the Canadian Atlantic Offshore Fishing Vessel Conference, Eleventh Pacific Science Congress, Fisheries Policing Conference, Food and Agriculture Organization of the United Nations, Great Lakes Fishery Commission, Gulf and Caribbean Fisheries Institute, Indo–Pacific Fisheries Council, Inter–American Tropical Tuna Commission, International

Commission for the Northwest Atlantic Fisheries, International Convention for the Conservation of Atlantic Tunas, International Council for the Exploration of the Sea, International Labor Organization, International North Pacific Fisheries Commission, International Pacific Halibut Commission, International Pacific Salmon Fisheries Commission, International Whaling Commission, North Pacific Fur Seal Commission, and UN/FAO Caribbean Fisheries Development Project Liaison Officers Meeting.

International Programs

Important international programs in which the Bureau participated in 1966 were the United Nations' Codex Alimentarius Commission and its Special Fund Project for the Gulf and Caribbean and the Foreign Currency Research Program.

Reporting on Foreign Operations

Fishing activities by foreign countries are expanding and changing continually. The Bureau obtains information needed to assess the impact of foreign fishery activities and developments on the U.S. fishing industry and on Government programs and policies. Overseas fishery attachés in U.S. embassies in Denmark, Ivory Coast, Japan, and Mexico continued to supply the United States Government and the commercial fishing industry with news on fishery developments in their regions. The attaché in West Africa prepared a series of reports on the rapidly developing fisheries in East Africa. Current information on the world's ever–changing fisheries provides a basis for many U.S. Government and industry decisions. Such reports are also used in international negotiations and in the resolution of international fishery problems.

The Bureau continued to provide current reporting on foreign fishing activities off United States coasts, particularly operations of Japanese and Soviet fleets and vessels.

Treaty Enforcement and Foreign Fisheries Surveillance

The Bureau helped the U.S. Coast Guard make aerial and sea patrols in the Northwest Atlantic Ocean, the Bering Sea, the Gulf of Alaska, and off the Oregon and Washington Coasts. These patrols provide effective surveillance of foreign fleet operations. The surveillance is made to satisfy the continuing concern and interest by members of Congress, officials of States, and the general public. The Bureau helped the Coast Guard with planning and provided qualified fishery management agents to accompany all patrol craft. To keep pace with mounting foreign fisheries, the

cooperators have increased the joint patrols from a few weeks of patrol by one ship in 1960 to continual year-round surface and aerial patrols by several ships. The assignment of a new Coast Guard cutter to the Alaska area in 1966 marked another step in the systematic strengthening of the U.S. patrol of international fisheries in this area.

Accomplishments and Operations

Principal Accomplishments

A summary of some of the Bureau's more important accomplishments in 1966 follows:

North Pacific

Accomplishments in the North Pacific region concerned Alaska bottomfish explorations; a method for peeling Alaska pink shrimp; Alaska shrimp studies; Alaska Stream investigation; budworm control; Columbia River Fishery Development Program; Columbia River water quality research; DDT contamination in Alaska; invention of a plastic driftcard; fish tag tests; development of plastic and fiber fishery product containers; king crab research; Naknek River water movement studies; Pacific hake explorations; Pacific hake studies; analysis of catch data of Pacific ocean perch; administration of Pribilof Islands fur seal industry; salmon abundance forecast; and research on salmon distribution in the Aleutian chain.

Alaska bottomfish explorations.—Using the Bureau vessel *John R. Manning,* the Bureau's Exploratory Fishing Base at Juneau in September 1966 made exploratory trawling surveys off Sitka in the Gulf of Alaska. The *Manning* averaged over 2,300 pounds per hour of Pacific ocean perch for 41 drags. Off Coronation Island, it caught 10,500 pounds of sharpchin rockfish in a 1-hour drag. In water depths of 690 to 750 feet, it took 1,600 to 3,600 pounds of Alaska pollock per drag.

Alaska pink shrimp.—Scientists at the Bureau's Technological Laboratory at Ketchikan, Alaska, overcame an obstacle to commercial production of Alaska pink shrimp. After considerable research they found a method for peeling the shrimp quickly and thus maintaining their quality and color. The method involves heating the whole shrimp at 165° F. for 15 seconds to set the pink color, then heating the shrimp at 110° F. for 3 minutes to loosen the shell so that it can be removed easily by a mechanical peeler.

Because of successful Laboratory tests of this method, plans have been made to run cooperative Bureau–industry commercial trials.

Alaska shrimp studies.—With the chartered vessel *Little Lady,* the Bureau's Exploratory Fishing Base at Juneau made a shrimp gear testing and exploratory fishing survey during May and June 1966 along the southeastern coast of Prince of Wales Island. Shrimp traps of six different designs were test fished and evaluated, and exploratory sets were made at 38 stations. After the vessel found commercial concentrations of spot shrimp in Hetta and Klakas Inlets and Cholomondely and Moira Sounds, two commercial shrimpers began fishing in these areas.

Alaska Stream investigation.—The Bureau's Biological Laboratory at Seattle, Wash., completed during 1966 an important report on variability and possible effect of the oceanographic current, the Alaska Stream, on forecasting distribution of Bristol Bay salmon and separation of stocks. On a research cruise of the Bureau vessel *Geo. B. Kelez* in January to March 1966 Laboratory scientists investigated the terminus of the Alaska Stream to determine the environmental distribution of salmon. Results of this cruise represented part of the U.S. contribution to the Cooperative Study on the Kuroshio (Japan Current).

Budworm control.—Biologists of the Bureau's Biological Laboratory at Auke Bay, Alaska, and personnel of the U.S. Forest Service continued their joint efforts to find an alternative control method for the black-headed budworm, which attacks the spruce in Alaska. Development of an insect parasite to control this budworm will preclude use of chemical pesticides that harm fish and invertebrates that are important as fish food. A biological control, *Bacillus thuringiensis* (a bacterium), had no harmful effects on coho salmon.

Columbia River Fishery Development Program.—This Program strives to preserve and increase the salmon stocks of the Columbia River Basin by means of hatcheries, screens on water diversions, and fishways over barriers.

Complementing these field operations are two study programs, "Appraisal of Project Results" and "Management Techniques." The appraisal investigation evaluates results of hatcheries, screens, ladders, and various stream improvement practices. The management investigation includes development of new techniques to improve resource management. The Program has resulted in construction of 21 hatcheries, 720 fish screens, 82 major fishways, and clearance of obstructions in 1,700 miles of streams. The Bureau cooperates with the conservation agencies of Wash-

ington, Oregon, and Idaho, and the Bureau of Sport Fisheries and Wildlife in programing hatchery egg and fish requirements; in timing and distributing fish stocks; and in solving problems associated with fishery management.

The hatcheries have been effective in increasing the numbers of coho salmon in the Columbia River, and more cohos are being caught by the fishery. The commercial catch was less than ¼ million pounds in 1959; about 2 million pounds in 1964; and about 4.2 million in 1966.

Coho and fall chinook salmon eggs that were surplus to the needs of hatcheries on the lower Columbia River were sent to the Snake River in Idaho and to areas above Rock Island Dam on the main Columbia. About 7,200 coho, for example, were counted in 1966 over Rock Island Dam; the previous high count of 732 was in 1962. Adult coho that hatched from eggs planted in Clearwater River in Idaho are being counted at Lewiston Dam as they pass over it on their way to spawning areas.

The sport fishery catch of coho salmon increased also. Sport anglers in the mouth of the Columbia River in 1965 caught about 250,000 coho. Their catch in 1964 was 134,000.

An appraisal study has been developed to measure the contributions of artificially raised fall chinook salmon to the Pacific Ocean and Columbia River commercial and sport fisheries. At 12 hatcheries constructed under the Development Program about 32 million, or about 14 percent of the total number of fall chinook salmon produced, have been fin clipped. These marked fish are being recovered from commercial and sport fisheries in the Ocean from Alaska to California. Recent calculations based on recoveries of marked fish from the 1961 brood in the Columbia River show tentatively that for each dollar spent in hatchery rearing about $3 worth of fish are harvested by the commercial and sport fisheries. When data are available on returns of marked fish of the brood years 1962, 1963, and 1964, contributions to various fisheries will be calculated. Evaluation of the production of fall chinook hatcheries is scheduled for completion in 1969 when all returns from 4 years of marking will be completed.

Because the hatcheries have been so successful with coho salmon, which have become major contributors to various fisheries, the Bureau began an evaluation study with the 1965 coho brood year fingerlings. This effort is similar to the current fall chinook salmon study. The coho fingerling study has been continued through the 1966 brood year at all Columbia River hatcheries that rear them.

The major construction effort in 1966 was development of fish passage facilities at Willamette Falls, Oreg., on Willamette River, a tributary to the lower Columbia River. The first stage of construction began in 1966. The second stage of construction is scheduled for early 1967. These fish passage facilities will permit fish to reach spawning areas in the Willamette River drainage and thus bring the River into full production for fall chinook and coho salmon.

The Bureau has given contracts for studies of how to improve management techniques. Receiving such contracts are State fish and game agencies, educational institutions, and the Bureau of Sport Fisheries and Wildlife. Program studies have improved the operations of hatcheries by conserving manpower, providing better production control, and increasing production at a lower cost. Good starts have been made in improving natural production, increasing survival of young, and determining economical means other than hatcheries for supplementing natural production. Refined techniques also have been developed for introducing fish into new areas, developing improved ways for identifying fish after their return from the Pacific Ocean, determining the optimum size for releasing fish from artificial propagation facilities, and examining various ways of altering fish habitats. Maximum use was made of the incubation channel on Abernathy Creek where 6 million eggs were planted in the gravel. Over 78 percent of the salmon larvae survives to the emergent stage—the highest known survival of fall chinook salmon eggs incubated in a controlled flow channel.

Columbia River water quality research.—Research of the Bureau's Biological Laboratory at Seattle, Wash., has shown that the Snake River has a profound effect on the limnology of McNary Reservoir. Separate physical, chemical, and biological environments are created in the area that extends from the confluence of the Columbia and Snake Rivers to McNary Dam. Cross sections of the Reservoir are characterized by different temperature, dissolved oxygen, turbidity, zooplankton, and chlorophyll extract from one side to the other with a central mixing zone.

DDT contamination in Alaska.—The Bureau's Biological Laboratory at Auke Bay, Alaska, has collected fish from sites throughout Alaska and has analyzed them for DDT. Results showed that DDT had extensively contaminated all areas except remote Arctic slopes in the northeast. Residues were especially high in the Fairbanks area, which has had military and civilian mosquito control programs for many years.

Driftcard invention.—A biologist of the Bureau's Biological Laboratory at Auke Bay, Alaska, devised a new type of lightweight, simple, and inexpensive plastic driftcard to chart surface ocean currents. A patent is being secured for the Bureau. This new driftcard is less subject to surface wind action than previous driftcards. It is also superior to conventional drift bottles in cost, weight, and responsiveness to currents. The driftcards have an international-orange color, are serially numbered, and have an integral return postage-free card. They have been used successfully in Southeastern Alaska to relate net surface water transport to migration routes of juvenile pink salmon.

Fish tag tests.—Bureau and contractor personnel have made a new model sonic tag that is to be placed inside a fish. The tag was tested at the Bureau's Bonneville Field Station in Oregon and at its Biological Laboratory at Seattle, Wash., to determine how it affected chinook salmon and steelhead trout. Tagged adult chinook salmon have been held for 5 weeks with no apparent ill effect. Because steelheads regurgitated tags that were placed in their stomach, researchers concluded that internal tags of the present design are unsuitable for steelheads.

Advanced design and construction of new external and internal sonic tags have extended the reception range on all models to 1 mile. Battery life has been increased to 10 weeks for the internal tag and 12 weeks for the larger external tag.

Fishery product containers.—After cooperatively determining the most desirable characteristics in reusable fish shipping containers and disposable ones, Bureau marketing personnel in the North Pacific, several plastic companies, fishing firms, and airlines incorporated these characteristics in plastic and fiber containers. Because fishery products can be air shipped now to many areas of the world, the improved containers will help expand U.S. fishery markets. Bureau marketing personnel also taught shippers how to obtain the best results from the containers and liners.

King crab research.—Data on Japanese and U.S.S.R. king crab catch and effort for the eastern Bering Sea continue to show the condition of the stocks. A preliminary study of U.S.S.R. data by the Bureau's Biological Laboratory at Auke Bay, Alaska, showed that the catch per unit of effort has been falling steadily since the beginning of its crab fishery in the eastern Bering Sea. The catch per unit of effort per day in 1960 was 2.48 crabs; in 1965 it had dropped to 0.47.

Naknek River water movement tracked.—Using fluorescent dye, biologists of the Bureau's Biological Laboratory at Auke Bay,

Alaska, tracked the movement of Naknek River water for 25 miles through Kvichak Bay, Alaska. Temperature and salinity measurements across the Bay showed vigorous vertical mixing and less saline waters offshore. Juvenile migrating salmon, or smolts, were in greatest numbers in turbid waters shoreward of the 120-foot depth contour. Smolts migrated mainly westward in more saline waters along the north side of the Alaska Peninsula and fairly close to shore.

Pacific hake explorations.—The Bureau's Exploratory Fishing Base in Seattle, Wash., in 1966 continued exploratory fishing for Pacific hake. The vessel *John N. Cobb* found hake populations over the Continental Shelf off Oregon and Washington where they are available in commercial quantities until November. A smaller population of hake was located inside Puget Sound. The anchovies in the Oregon-Washington coastal area are a resource that could be fished during the off season for hake.

Pacific hake studies.—Because the Bureau-designed midwater trawl has made it possible to catch large quantities of Pacific hake, the Bureau is investigating the potential use of this fish. The Bureau's Technological Laboratory at Seattle, Wash., in 1966 continued to study the possible demand for Pacific hake in the edible fish market. The Laboratory is working on the development of products, such as fresh fillets, frozen fillets, frozen fish blocks, and specialty items. An important finding is that hake are satisfactory for fish sausage or fish cakes. The characteristic softening of the hake flesh, however, will deter the sale of this fish in the fresh market, so further study of this problem is needed. The Laboratory is continuing its research on the reduction of Pacific hake into fish meal, oil, and solubles. A plant was built in the State of Washington in 1966 to produce fish meal from hake. This new industry has a potential for further development.

Pacific ocean perch.—The Bureau's Biological Laboratory at Auke Bay, Alaska, has analyzed the catch data gathered by its biologists aboard Japanese trawlers in the Gulf of Alaska and the Bering Sea. Day and night captures of Pacific ocean perch differ markedly. Day catches average over 2½ times the weights of night catches. These catch differences probably reflect the daytime behavior of Pacific ocean perch. Electronic recording devices show the fish clustered near the bottom during the day and dispersed vertically during darkness. The Atlantic ocean perch, a close relative to the Pacific ocean perch, has similar habits.

Pribilof Islands fur seal industry.—The Bureau in 1966 continued to administer the fur seal industry of the Pribilof Islands

and the communities of St. Paul and St. George. Because only male seals were harvested during the 1966 season, the take of 52,866 sealskins (42,365 on St. Paul Island and 10,501 on St. George Island) fell below that of previous years. Under terms of the Interim Convention on Conservation of North Pacific Fur Seals, the Governments of Canada and Japan each received 15 percent of the sealskins harvested. Of the U.S. share, 4,626 skins were reserved for research and development.

At spring and fall auctions in 1966, 42,021 sealskins were sold for the account of the U.S. Government. Gross sales of these skins totaled $4,519,768 and netted the U.S. Treasury $3,186,901.59.

Services comparable to those performed by an Executive Director were again provided the North Pacific Fur Seal Commission during the interval between the ninth annual meeting in Ottawa, Canada, February 21 to 24, 1966, and the tenth annual meeting to be held in Washington, D.C., February 1967.

The Fur Seal Act of 1966, enacted November 2, 1966, leaves substantially unchanged the section on conservation and protection of the North Pacific fur seals. The Act, among other things, gives effect to the Fur Seal Convention of 1957; provides means for establishing a townsite and an incorporated village on St. Paul Island; provides additional Civil Service retirement benefits for Aleut residents; transfers responsibility for funding the Pribilof medical program to the Public Health Service; and provides for an annual consultation with State of Alaska officials about expenditures of receipts from the sale of sealskins.

The Bureau continued its research and development program in 1966 to improve sealskin processing techniques and to develop competitive knowledge in processing Alaska sealskins. Two other firms in 1965 expressed an interest in the research and development program, and the Bureau in 1965 provided each firm with 80 raw sealskins for experimental processing. The National Bureau of Standards tested these skins, and fur seal industry representatives evaluated them. Prices received for these skins at public auction in New York City in September 1966 were generally lower than those received for the well-established products of the company that processed most of the sealskins.

Salmon abundance forecast.—Fishery scientists of the Bureau's Biological Laboratory at Seattle, Wash., fished for salmon in the eastern Bering Sea in June 1966. They used the vessel *Geo. B. Kelez* to obtain information on relative numbers and timing of the incoming return of sockeye salmon to Bristol Bay. Their results caused these scientists to change their earlier forecast of 33 mil-

lion fish. Their new forecast was 8 to 17 million. The run in 1966 was about 19.5 million. This forecast benefited both the fishing industry and the State of Alaska fishery management agency.

Salmon distribution in the Aleutian chain.—On cruises of the *Geo. B. Kelez* south of Attu Island in the Aleutian chain, fishery scientists of the Bureau's Biological Laboratory at Seattle, Wash., found concentrations of salmon in areas later fished by the Japanese mothership fleet. Information from these cruises provided the basis for understanding the relation of salmon distribution and Japanese fishing. Samples of scales and blood, also collected on these cruises, determined the geographic origin of the salmon and indicated what proportion of the sampled population would enter the U.S. fishery in 1966.

California

The chief accomplishments in California involved the anchovy fishery; costs and earnings of tuna seiners; fish cookery and handling; marine fish culture; collection of oceanographic data; plankton sampling gear; purse seine design and construction of a model; and sonar equipment.

Anchovy fishery.—A new anchovy fishery in California has stimulated the Bureau's California Current Resources Laboratory at La Jolla to carry on further research on this important commercial species. Surveys of eggs and larvae, conducted under the aegis of the California Cooperative Oceanic Fisheries Investigations (CalCOFI), have provided evidence that the abundance of anchovy larvae increased 10–fold during 1951–65 and that the population of adult anchovies now represents a resource of 4 or 5 million tons. To establish a base year against which to measure future fluctuations in the anchovy population, the Bureau's Laboratory, using the new research vessel *David Starr Jordan,* resumed monthly surveys of eggs and larvae off the coasts of California and Baja California.

Using methods developed at the Bureau Laboratory, the California Department of Fish and Game has tagged 50,000 anchovies with small, metal, internal tags to study their migration and distribution along the California Coast. The Laboratory is continuing to study anchovy tagging mortality and tagging techniques to improve the efficiency of the State's program.

Costs and earnings of tuna seiners.—The fishing industry has been able to apply the results of a cooperative study by the staff of the Bureau Tuna Resources Laboratory and Van Camp Seafood Company on the efficiency of tuna seiners. In the past 5 to 10

years the efficiency and composition of the California-based tuna fleet have changed, and the trend has been to build larger tuna purse seiners. These changes raised questions on how vessel size and other factors affect earnings. An analysis was made of cost of operation and gross revenues of ships in the fleet during 1952–57 (adjusted to current operations) based on catch rates, tuna prices, vessel size, species composition of the catch, average days at sea each year, and catch rate efficiency. Under the prevailing conditions of catch rates and prices, the optimum vessel size was one that could carry about 420 tons of tuna.

As a result of these studies, National Marine Terminals of San Diego, Calif., have launched Operation Stretch that will add 14 feet to the twelve 118-foot vessels that it operates. This lengthening increases their capacity from 350 tons to 430 tons but does not necessitate an increase in the number of crew or in the operating cost of the vessel. The first of the "jumboized" vessels, the *Elsie A*, was launched in October 1966.

Fish cookery and handling.—Bureau marketing personnel in California carried on programs to increase the use and acceptance of fishery products. The programs involved demonstrations of how to handle and cook the fish. Attending these programs were school lunch supervisors, apprentice butchers (who also work behind the seafood counter), college home economics majors, and advanced students enrolled in the Navy food service school. A program had two parts. A fishery marketing specialist lectured on purchasing, handling, nutritional value, ease and variety of preparation, economy, and availability of fishery products. A home economist then prepared several seafood recipes and discussed menu planning and care of fishery products. After the seafood was eaten, the program concluded with a question and answer period.

Marine fish culture. — The Bureau's California Current Resources Laboratory at La Jolla reared Pacific mackerel and sardines from the egg to an advanced juvenile stage in its experimental sea-water aquarium. Very young fish were fed natural plankton (microscopic plants and animals collected at sea). Abundant food and warm water stimulated rapid growth. Most mackerel, for example, grew to almost a half inch in length in 7 days and to almost 1 inch in 2 weeks. This major breakthrough is one of the most important recent developments in marine fishery biology. It will permit Bureau scientists to better understand the life history and habits of these fish and to determine the factors that influence survival. The abundance of fish populations of commercial value is affected markedly by early survival.

Oceanographic data collection.—The Bureau's Biological Laboratory at Stanford, Calif., is testing a new system for obtaining the oceanographic information that is important to the commercial fishing industry. From such information, it may be possible to predict where the environment is most favorable for concentrations of commercial fish. The system consists of an electronic thermometer known as an expendable bathythermograph, or XBT. It can be dropped from a moving ship at speeds up to 30 knots (35 statute miles an hour). As it sinks rapidly downward, it registers on shipboard a continuous record of temperature down to 1,500 feet in 90 seconds. Because the ship need not stop and because the system does not require special technical skill beyond that already possessed by ships' officers, the XBT offers the possibility of being used by cooperating merchant ships and other ships of opportunity. This is the most economical means known of getting temperature data below the ocean surface. Because of the generous cooperation of the Matson Navigation Company and its ships' officers, the test of this method is proceeding satisfactorily.

In addition to determining the reliability and accuracy of this device for collecting oceanographic information, the proposed 14-month test of the XBT system will give seasonal temperature changes and, by computation, seasonal variations also in strength and location of boundaries of the California Current which flanks our Pacific Coast. Continued in future years, it would tell how seasonal cycles of temperature vary from year to year.

Plankton sampling gear.—The Bureau's California Current Resources Laboratory at La Jolla made major gains in 1966 toward the development of better plankton sampling gear for accurately assessing productivity in the ocean. Biologists on special cruises of the *David Starr Jordan* in 1966 studied the hydrodynamics of plankton nets, especially the clogging rate as related to mesh aperture size and amount of plankton. Data are available that will permit sampling nets to be designed efficiently for any given environmental conditions.

Purse seine design and construction of a model.—The staff of the Bureau's Tuna Resources Laboratory at La Jolla and a visiting scientist from Israel have tried to improve fishing efficiency by reducing the percentage of tuna schools that escape while the purse seine is being set. After studying operations of nets from various countries, these scientists produced a new design for a purse seine and constructed a model for study in a swimming pool and a lake. Studies of the model show that a purse seine can be designed to sink in about half the time of the seines now in use. Also, with a

different configuration at the ends of the net, the purse seine will fish more deeply at the boat. The same total quantity of mesh is used along the same length of cork line but with a different hang-in or looseness ratio and a different configuration in depth. Because the model studies indicate that this design will be much more efficient than the nets in use, the California tuna industry is supporting the construction of a full-sized modified purse seine that will be tested by the local fleet.

Sonar equipment.—The research sonar equipment on the *David Starr Jordan* may supplant conventional surveys as a method for assessing abundance of fish populations. Sonar observations, obtained by the Bureau's California Current Resources Laboratory at La Jolla, on several cruises of the *Jordan,* show promise that the extent, identity, and abundance of anchovy and other schooling fishes in the California Current area may be determined accurately.

Hawaii

In the Hawaiian area the chief accomplishments concern an oceanographic atlas for the Pacific Ocean and tuna studies.

"Oceanographic Atlas of the Pacific Ocean."—A significant accomplishment of the Bureau's Biological Laboratory at Honolulu was the completion of the "Oceanographic Atlas of the Pacific Ocean." It provides a definitive summary of data from more than 50,000 oceanographic stations taken by various agencies between 1917 and 1964; it describes also the environment of every known and potential fishery resource of the Pacific Ocean.

As one byproduct of the Atlas, records for the western Pacific region where the warm Kuroshio current meets the cold Oyashio current off Japan were examined in the light of a theoretical model that accounts for currents and distributions of temperature and other variables in a qualitative and a quantitative manner. This model could provide a powerful tool to both fishermen and scientists for understanding and predicting events in this key area of the North Pacific. Even more importantly, it may explain what happens in analogous regions of other fishery areas of the world, such as the rich Gulf Stream–Labrador Current region. In studies of central Pacific resources, the model is being applied to the Hawaiian region, where a similar but lesser phenomenon exists in the wake of the island chain, an area now fished only by Japanese longlines.

Tuna studies.—The Bureau's Biological Laboratory at Honolulu has developed evidence leading to the conclusion that one of the

last large untouched tuna resources in the world lies in the Central Pacific Ocean. This is the stock of skipjack tunas that are older than the young fish caught in the eastern Pacific Ocean and younger than the old fish taken in the Japanese longline catch in the central Pacific. The intermediate size group supports a small industry in Hawaii, but the bulk of them is never caught. Estimates of the size of this stock vary between a 2–fold and a 17–fold increase of maximum sustainable yield over the present 77,000 tons caught annually in the eastern Pacific. This resource is probably subsurface and somewhere between the Equator and lat. 15° N., and between long. 120° and 150° W. Oceanographic research at the Laboratory has provided clues on where these tunas are most likely to be found in this vast area. Information on the vertical distribution of these fish is lacking but will soon be supplied.

An advanced–design sonar was installed in 1966 on the Laboratory's research vessel *Townsend Cromwell.* The sonar will detect a skipjack at a distance of about 720 feet from the ship and skipjack schools at greater distances. Laboratory scientists have measured swimming speeds of subsurface fishes. They are beginning to relate the vertical distribution of fish targets with the vertical oceanographic structure.

For several years the Laboratory has made pioneering studies on tuna physiology and behavior. Its accomplishments in 1966 were substantial: First, determination that the little tunny is less sensitive to underwater sound than the yellowfin tuna. Second, studies of vision have shown that skipjack tunas should be able to recognize their own kin at a maximum distance of about 10 feet when they are 100 feet beneath the surface (information that may bear very importantly on their schooling habits) and recognize the characteristic particolored feeding display of the tunas at a far greater distance (36 feet) ; that the little tunny and possibly other tunas and tunalike fishes are less responsive to food flavors at night than during the day. Third, that the response of tunas to food flavors is probably by olfaction rather than taste. Fourth, that little tunny, the handiest experimental fish of the tunalike fishes, feed only in the daytime.

Gulf of Mexico

In the Gulf of Mexico area the chief accomplishments were harvesting fishes for industrial use; market development of underutilized species; harvesting shrimp; shrimp studies; and unutilized and underutilized fish resources.

Harvesting fishes for industrial use.—In the northern Gulf of Mexico the Bureau's Exploratory Fishing Base at Pascagoula, Miss., tested techniques for harvesting anchovies and herringlike and sardinelike groups of fishes for industrial uses. During a cruise of the *Oregon* in February 1966, Bureau personnel tested a system using a night light and a fish pump.

Market development of underutilized species.—Bureau marketing personnel in the Gulf of Mexico developed markets in 1966 for mullet, Spanish mackerel, calico scallops, and soft clams. They introduced these underutilized species to restaurant chains, State school lunch programs, and State institutions.

Canned mullet made a favorable impression. Three restaurant chains agreed to use it. Most schools and State institutions also are using this product. Its reception in foreign countries was also good. Canned mullet was sold to the Congo, through the program of AID (Agency for International Development). At the international food trade fairs in which it participated, the Bureau's Office of International Trade Program displayed mullet, which was of considerable interest to European buyers.

Spanish mackerel fillets also were being used by about a dozen cafeteria chains. The Florida Board of Conservation is helping the chains by providing them with promotional materials.

The promotion of calico scallops by industry, North Carolina State officials, and Bureau marketing personnel was another success. One large restaurant chain bought 200,000 pounds of them; and a large seafood processor, 100,000 pounds. A large shrimp company is experimenting with these scallops for possible national distribution.

Still another product that has been successfully introduced in the Southern States is soft clams. They are a permanent item on the menu of a restaurant chain. Several shrimp processors also are interested in adding them to their lines of fishery products.

Shrimp harvesting.—The Bureau's Exploratory Fishing Base at Pascagoula, Miss., in 1966 completed the development and testing on a commercial scale of an electrical trawling method for catching brown and pink shrimp. The electrical trawl catches these shrimp during the day when they normally are in burrows in the mud of the sea bottom and are not taken by conventional shrimp trawls. (Previous fishing for brown and pink shrimp has been limited mostly to the night.) Electric currents discharged from an electrode array, towed in front of the electrical trawl, stimulate shrimp to jump from burrows into the path of the advancing trawl.

Catch data from comparative shrimp trawl tows made with one conventional trawl and one electrical trawl show that day catches made with the electrical trawl are about equal to normal night catches made with conventional trawls. Electrical trawl catches averaged 109 percent of night catches made with conventional trawls off the Alabama Coast and 96 percent of those made off the Texas Coast. When results of these studies are widely known, the fishing fleet is expected to rapidly adopt commercially available electro-trawling units.

Shrimp studies.—Biologists at the Bureau's Biological Laboratory at Galveston, Tex., continued their studies of shrimp culture. They reared shrimp through the larval stages from eggs spawned in the Laboratory. The growth of the shrimp was increased markedly by providing them with suitable foods and maintaining the proper water quality.

These biologists believe it will soon be possible to culture shrimp to restock areas where natural stocks have been reduced. They believe also that shrimp can be commercially farmed in the United States as in Japan.

Prediction of abundance of brown shrimp off Texas by Bureau scientists at Galveston is now a routine program, based upon computer techniques and routine sampling on offshore trawling grounds and bays.

These scientists found also that postlarval brown shrimp appear to overwinter near shore in water shallower than 18 feet. These burrow into the bottom and remain dormant until the water temperature reaches about 65° F.

Data on growth, mortality, and dispersion from tagging pink shrimp in the Tortugas area indicate that harvests are approaching the maximum sustainable yield.

Shrimp larvae, according to these scientists, are distributed in patches, limited both vertically and horizontally. These patches do not diffuse except under conditions of extreme turbulence. Currents critically control eventual distribution of the larvae to estuaries.

Bureau personnel found also that shrimp nursery areas that have been dredged and bulkheaded for harbor improvement or land development produce fewer shrimp than do undisturbed areas.

Unutilized and underutilized fish resources.—Using the Bureau vessel *Geo. M. Bowers* and a chartered airplane, scientists from the Bureau's Exploratory Fishing Base at Pascagoula, Miss., studied the extent and size of unutilized and underutilized fish resources in

the Gulf of Mexico. Large schools of thread herring were surveyed with echo sounding from the surface and aerial photography from an airplane. The scientists estimated that the Gulf of Mexico has about 1 million tons of thread herring. Although less information is available on the anchovy, they think the same quantity of anchovies may be present. They also tested gear to develop techniques for catching thread herring and anchovies.

Atlantic

The chief accomplishments of the Atlantic Coast include new information on deep–sea fishes; a data exchange system; environmental studies in New England; Fish Protein Concentrate; fish systematics; fishes of south Atlantic States; groundfish and sea scallops; irradiation preservation of fish; maps of the middle Atlantic Continental Shelf; menhaden; oyster culture in salt–water ponds; river herring; shellfish farming; shellfish mortality; shellfish selective breeding; surf clam survey; swordfish and tuna explorations; tropical Atlantic fishes and environment; tuna studies; and the Woods Hole Aquarium.

Bermuda deep–sea fishes.—Using the R/V *Undaunted* of the Bureau's Tropical Atlantic Biological Laboratory at Miami, Fla., personnel of the Bureau's Ichthyological Laboratory at Washington, D.C., fished for deep–sea fishes near Bermuda. The 10–foot Isaacs–Kidd mid–water trawls made poor catches of adult bathypelagic fishes at depths of 1,771 feet, 2,460 feet, and 7,216 feet. A series of tows with a 6½–foot diameter plankton net at depths of 400, 705, 1,128, 1,830, 2,572, 3,031, 3,680, and 4,920 feet, however, made rich catches of larval fishes. In eight surface collections at night, dip nets caught larger specimens but fewer species of lanternfishes, and surface tows took smaller specimens but more species of lanternfishes. Astronesthid fishes were taken only in surface tows.

Personnel from the University of Miami Medical School participated in this cruise to obtain blood, urine, kidney tissue, and luminescent tissue from fresh specimens of deep–sea angler fishes.

Data exchange system.—The Bureau's Tropical Atlantic Biological Laboratory at Miami, Fla., has organized a data exchange system with some West African countries. Contacts with the French–supported ORSTOM Laboratories in the French West African colonies have been particularly beneficial. The information on oceanography and fisheries is important to Bureau projects and will also be useful to the Commission for the Conservation of Atlantic Tunas when it is established.

Environmental studies in New England.—The Bureau's Environmental Oceanographic Research Program, Washington, D. C., continued its studies of the temperature requirements and tolerances of sedentary marine animals of the New England fishing grounds. Samples of the bottom animals were dredged every 6 weeks off Cape Cod, Mass. The U.S. Coast Guard cooperated in maintaining temperature recorders on the bottom at various depths in the study area. These recorders, designed to operate without attention for up to 400 days, are recessed in the 6½-ton concrete mooring blocks of large navigation type buoys. The success of this method for maintaining instruments in an exposed Continental Shelf area is significant, for it offers a means for regularly obtaining environmental data on the fishing grounds.

FPC (Fish Protein Concentrate).—Progress continued to be made in the FPC research program that began in 1963. Studies of processing and engineering are being made at the Bureau-constructed and Bureau-operated model FPC unit at the Bureau's Technological Laboratory, College Park, Md. The unit can produce daily 100 pounds of FPC from fresh fish and provides FPC for chemical tests, feeding studies, and economic feasibility analyses. Data from the model studies are being used to develop engineering and design criteria for constructing pilot and commercial-size plants. These data were used also to develop a food additive petition that the Bureau submitted in February 1966 to FDA (Food and Drug Administration). The Bureau later provided FDA with additional material to support the petition that substantiates the nutritive value and wholesomeness of FPC as developed by the Bureau.

Production of a satisfactory FPC will upgrade the economic position of the U.S. fishing industry and also provide high-quality protein for the peoples of geographical areas now suffering from malnutrition and starvation.

Fish Systematics Program.—The Bureau's reference collection of western tropical Atlantic fishes—about 1,500 species in 15,000 separate collections—was moved in July 1966 into a new, 2,500-square-foot, air-conditioned annex to the Bureau's Tropical Atlantic Biological Laboratory at Miami, Fla. Work continued on the preparation of field guides to the western Atlantic Carangidae (jacks, scads, and pompanos) and to the Clupeidae (herringlike fishes) of the Indian Ocean. These guides will be part of a series of field guides designed for scientists and commercial and sport fishermen.

Fishes of South Atlantic States.—The Bureau's Biological Lab-

oratory at Brunswick, Ga., devoted its major efforts in 1966 to studying young fishes of a coastal tidal zone. Identification of young fish from almost 8 years of seining in ocean beaches, marshes, and tidewater of a fresh-water river has been completed.

The study on fishes taken incidental to shrimp trawling continued. This research will provide information on the biology of the fish fauna in the estuaries and coastal environments of this southeastern area.

Groundfish and sea scallops.—The Bureau's Biological Laboratory at Woods Hole, Mass., continued its study of the effect of fishing on populations of New England groundfish and sea scallops. Intensified U.S.S.R. fishing on haddock, cod, silver hake, red hake, yellowtail flounder, and sea scallops has increased the importance of these studies. Because most of these stocks are now fished at or beyond their maximum sustainable yields, international agreement on limitation of catch is imperative.

The Bureau's research vessel *Albatross IV* has now completed the first 3-year series of intensive surveys of groundfish and the environment. These surveys establish ecological bench marks for future studies. This program has also demonstrated the usefulness of new survey techniques that use a single vessel to estimate the abundance of fish.

Irradiation preservation of fish.—AEC (Atomic Energy Commission) has constructed irradiation units for use on Bureau research vessels. The units destroy the bacteria that cause fish to spoil. When landed on the vessel, fish have few bacteria; their quality is at its peak. Immediately after death, enzymatic changes occur, and the bacteria increase, causing loss of quality and then spoilage. Even though kept in ice, fish are highly perishable. Trips from ports to fishing grounds and return may take many days, so there is ample time for deterioration in quality.

The Bureau is using these irradiators in the Northwest Atlantic and in the Gulf of Mexico. If it is feasible to use irradiation at sea, fish of extremely high quality can be landed. With this process a vessel might remain at sea 20 to 25 days and still deliver a load of high-quality fish.

Several species including haddock and clams have been recently irradiated at sea. The Bureau's Technological Laboratory at Gloucester, Mass., is now testing their odors and taste.

The MPDI (Marine Products Development Irradiator) at Gloucester, Mass., constructed by AEC and dedicated in 1964, is being used for several studies. These are (1) the effect of commercial handling methods on quality of irradiated products, (2) large-

scale consumer evaluation of these products, and (3) economics of the irradiation process. This unit irradiated over 150 lots of products, totaling over 42,000 pounds in 1966. Most of the products irradiated were fish, but fruits, meats, chickens, and nonfood products were also handled. In some of this irradiation, the Department of the Army and the U.S. Department of Agriculture cooperated with the Bureau.

The Bureau has submitted a petition to FDA (Food and Drug Administration) to permit commercial use of irradiated cod, haddock, pollock, flounder, and sole. FDA holds that radioisotopes are a food additive, so its approval is necessary.

Maps of the Middle Atlantic Continental Shelf.—The Bureau's Environmental Oceanic Research Program, Washington, D. C., completed detailed bottom topographic mapping of the Middle Atlantic Continental Shelf and arranged for the U.S. Coast and Geodetic Survey to publish the maps. They will increase understanding of the environmental factors that influence distribution and abundance of fish. Because bottom topography affects bottom sediments, temperature, currents, and other environmental factors, scientists can use the maps to interpret data on these factors and to plan research cruises. Fishermen can use the maps to locate favorable fishing grounds.

Menhaden studies.—The menhaden fishery, our most important fishery in terms of pounds landed and our fourth most valuable, is beset by many problems. The fishery and the resource may be characterized in recent years by declining catches, increased proportions of younger fish, poor spawning since 1958, and a shift of the fishery to the South Atlantic and Gulf of Mexico. The Gulf of Mexico catch dropped sharply in 1966.

To understand the causes of these problems, scientists at the Bureau's Biological Laboratory at Beaufort, N.C., have expanded their study of menhaden on the Atlantic and Gulf of Mexico Coasts. A major tagging study is under way to better define growth, mortality, movements, and stocks. New tags and methods of recovery are being used.

Oyster culture in salt-water ponds.—The Bureau's Biological Laboratories at Oxford, Md., and Galveston, Tex., are investigating the use of the many natural and artificial salt-water ponds along Maryland and Texas Coasts as controllable environments for rearing oysters. The scientists suspended hatchery-reared seed oysters on shell strings from rafts or frame structures in these ponds. Fertilizer was added to the water to stimulate production of food for the oysters. By markedly increasing growth and re-

ducing predation, this method has resulted in a much greater production of oysters than would have occurred on natural beds.

River herring.—The Bureau's Technological Laboratory at Gloucester, Mass., and the Atlantic Herring Association studied ways to improve the quality of canned river herring. The technologists were able to stabilize the color of tomato sauce added to 1-pound oval cans of herring and thus improve the appearance of the product. The scientists are investigating several other river herring products. Various concentrations of a liquid smoke flavor have been added to precooked alewives that were then sealed and heat sterilized. Canned fillets with liquid smoke flavor and tomato sauce also were prepared. Samples of all these packs are going through storage life and product quality evaluation.

Shellfish farming.—The Bureau's Biological Laboratory at Milford, Conn., has studied clam and oyster rearing. These studies have helped commercial cultivators of shellfish. Ten commercial hatcheries in the United States are using the knowledge and methods acquired in these studies. They are spawning and rearing clams and oysters to sizes that can be planted on the beds. These small shellfish are called "seed" when they are planted. Many employees of these hatcheries were trained at the Laboratory in Milford. In 1966, the first commercial shellfish hatchery on the Pacific Coast was established.

Shellfish mortality.—Because predators, parasites, and diseases can prevent successful shellfish culture, the biologists at the Bureau's Biological Laboratories at Milford, Conn., and Oxford, Md., are investigating these enemies and their control. Two Bureau papers published during 1966 describe the spore stage of *Minchinia nelsoni* (known also as MSX) and provide another link in understanding its life history. Periodic sampling of oysters in Chesapeake Bay has provided a greater understanding of the prevalence and distribution of MSX.

A shellfish disease specialist from the Laboratory at Oxford and a shellfish biologist from the State of Washington went to Japan, Korea, and Taiwan during 1966 to see what diseases and microparasites are present in the seed oyster stocks that may be imported for stocking on the West Coast.

Cooperative studies among the Laboratory at Oxford and the States of New York, Delaware, New Jersey, Maryland, and Virginia are making excellent progress in developing MSX-resistant oyster stocks.

In another cooperative study, biologists from Oxford are helping

the States of Washington, Oregon, and California study oyster mortalities of unknown origin.

Shellfish selective breeding.—Preliminary studies by scientists at the Bureau's Biological Laboratory at Milford, Conn., have demonstrated that selective breeding for desirable characteristics in shellfish, such as rapid growth and resistance to disease, can be as important to shellfish culture as it has been to modern agriculture. A geneticist at the Laboratory has begun research on genetic variation, production of mutations, and arrangement of chromosomes in clams and oysters.

Surf clam survey.—The Bureau's Exploratory Fishing Base at Gloucester, Mass., continued its surf clam survey with the Bureau vessel *Delaware* along the middle Atlantic Coast 5 to 25 miles from shore. Some tows of the 4-foot-wide jet dredge took more clams than was initially expected. Many areas yielded 1 or more bushels per 4-minute tow; some areas yielded up to 18 bushels per tow.

During a cruise with the *Delaware,* Bureau gear specialists tested an experimental clam dredge that used an electrically driven submersible electric water pump in place of the conventional deck-mounted pump. Preliminary results indicated that the Bureau-developed dredge might be more effective and efficient than the conventional type, particularly when fishing in depths over 120 feet. The new pump eliminates the bulky 6-inch rubber hose that the conventional pump has to use.

Swordfish and tuna explorations.—The Bureau's Exploratory Fishing Base at Gloucester, Mass., continued exploratory fishing for swordfish and tunas in the North Atlantic. Special emphasis was placed upon use of environmental data, particularly sea surface and subsurface temperatures, to find areas most favorable for fishing operations. Sea surface isotherm and thermocline depth charts were received daily by a radio facsimile recorder aboard the Bureau vessel *Delaware* and used to locate the optimum environment for tunas. These charts use the data prepared by the Navy's Oceanographic Office and broadcast to vessels at sea as part of the Anti-Submarine Warfare Environmental Predictions Service. The Navy radioed several times daily and this saved much time that would otherwise be required for searching out suitable environments, which were fished later with longline gear.

Using similar longline gear, the Bureau's Exploratory Fishing Station at St. Simons Island, Ga., made four cruises with the Bureau vessel *Oregon* in 1966 off the southeast Atlantic Coast to gain additional information on seasonal distribution, abundance, and migrations of swordfish and tunas. Immediately upon com-

pletion of each cruise, results were forwarded to industry members for their use.

Tropical Atlantic fishes and environment.—The Bureau's Tropical Atlantic Biological Laboratory at Miami, Fla., continued to study distribution and abundance of marine fishes as related to the environment. Studies of the eastern tropical Atlantic show that waters of the Gulf of Guinea are among the world's most productive oceanic areas. In an area of upwelling in waters off the Republic of Ivory Coast, for example, inorganic carbon is fixed by phytoplankton at a rate of 0.78 gram of carbon per square meter per day, whereas the average production rate for the open ocean is thought to be about 0.15 g.C/m.^{2}/day.

Tuna studies.—During oceanographic and fish surveys by the *Geronimo* and the *Undaunted* of the Bureau's Tropical Atlantic Biological Laboratory, Miami, Fla., large schools of yellowfin and skipjack tunas were found west of St. Vincent Island and west of the northern Grenadines (Lesser Antilles). Preliminary investigations indicated that the fish were congregated in association with an eddy system leeward of the island chain. Aircraft observations supplemented surface observations.

Studies of larval fish distribution and abundance yield valuable information on spawning populations of adult fish. Work continues on identification of tuna larvae from the western Atlantic. Unexpectedly, larvae of bigeye tuna are most abundant; larvae of skipjack tuna occur commonly in the samples.

For the first time an analysis of the Japanese Atlantic longline fishery became possible because the Japanese Government published detailed catch and effort statistics. The heavily increased fishing effort (from about 100,000 hooks in 1956 to over 55 million in 1963) reduced the abundance of yellowfin tuna throughout most of the tropical Atlantic. Although less heavily fished, albacore also declined in abundance.

Woods Hole Aquarium.—Attendance in the summer of 1966 at the Woods Hole, Mass., Aquarium continued at its previous level of nearly 3,000 visitors a day. The Bureau's Biological Laboratory at Woods Hole operates the Aquarium for both educational and experimental purposes.

Great Lakes

The chief accomplishments in the Great Lakes region are development of an alewife reduction industry; study of Lake Michigan fish populations; improvement of Lake Superior commercial

fishing industry; study of Missouri River reservoirs; and control of sea lampreys.

Alewife fishery.—The Bureau's Exploratory Fishing Base at Ann Arbor, Mich., has stimulated and supported the development of an alewife reduction industry in the Great Lakes region. Reduction plant capacity on Lake Superior and Lake Michigan has grown to 1.2 million pounds per day, and the catch of alewives for 1966 in these Lakes was 29 million pounds. Recent surveys in Lake Huron have located an unfished stock of alewives. Estimates based on surveys and catches indicate that alewife production in the Great Lakes can grow to at least 70 million pounds annually. The Bureau is providing technical assistance to encourage the enlargement of the fishing fleet so that more alewives can be caught to satisfy the expected increase in demand by reduction plants.

Lake Michigan fish populations.—An intensive study was completed of conditions that caused drastic changes after 1900 in the population structure of major fish stocks in Lake Michigan. High fishing intensity plus the explosive increase in the sea lamprey population in the 1940's destroyed the lake trout resource. Sea lampreys also drastically reduced the population of larger chubs. By the mid-1950's one small species of chub became abundant because it was not vulnerable to sea lamprey attack and because carnivorous fish were no longer available to prey on it. Heavy fishing on this chub reduced its population and thus created an environmental niche that brought about the population explosion of the alewife, which is now the dominant fish in Lake Michigan.

Lake Superior commercial fishing industry study.—The Bureau, the Economic Development Administration (successor of Area Redevelopment Administration), and the fishing industry cooperated in 1966 in an effort to improve the Lake Superior commercial fishing industry. They installed a full-scale processing facility at Hancock, Mich. A private company formed by Lake Superior processors operates it, and a Bureau representative provides technical assistance to the plant director. The cooperators designed the operation primarily to produce raw, individually quick frozen unbreaded and breaded cisco and chub fillets, and headed and gutted smelts.

Missouri River reservoirs.—The Bureau's Biological Laboratory at Ann Arbor, Mich., began a study of the aquatic environment of Oahe Reservoir, S. Dak. The Laboratory's staff at Mobridge, S. Dak., established several limnological stations and collected data on water level fluctuations, bank erosion, silt deposition, character-

istics of the Reservoir soil, water temperatures, turbidity, plankton, bottom fauna, and water chemistry. Routine sampling of these characteristics will furnish data for studies on factors that influence the growth and survival of fish stocks in the Reservoir.

Personnel at Mobridge field station also made exploratory fishing and gear studies to provide information on seasonal abundance and availability of the fish, to find areas suitable for trawling, and to determine what size of trawls is most satisfactory for the Oahe Reservoir. Commercially significant catches (averaging 150 pounds per 15–minute drag) of carp, buffalofishes, and carpsuckers have been made.

Sea lamprey control.—The abundance of lampreys declined significantly in 1966 in Lake Superior. The catch of adult lampreys at electrical barriers on 16 index tributary streams in U.S. waters decreased 60 percent from 1965. This decrease amounts to a 90–percent reduction over the level of abundance before lamprey control measures were started. The Canadian Department of Fisheries also reported comparable decreases in Canadian waters. Initial treatments of all lamprey–producing streams in Lake Michigan were completed during 1966, and, in addition, 18 lamprey–infested streams on the U.S. side of Lake Huron were successfully treated with the chemical lampricide.

Lake trout stocks are responding favorably to reduced lamprey populations. In Lake Superior the incidence of fresh lamprey wounds on trout in most inshore areas has declined about 90 percent since 1961. Abundance of lake trout in the Lake has been increasing at an annual rate of about 25 percent in recent years because of the reduced lamprey population and because of the stocking of hatchery–reared trout. Treatments of lamprey–infested streams were completed only recently in Lake Michigan, and an assessment of their impact on lake trout will require more time.

General

Many Bureau activities in 1966 had nationwide effects. These activities include the Commercial Fisheries Research and Development Act of 1964; cooperatives; economic situation and outlook reports; exploratory fishing in fresh water; fishery product publicity; fishery statistics; inspection and certification program; Market News Service reporting; marketing cooperators sought; National Anadromous Fish Program; oil and gas activities; pesticide surveillance; pollution studies; smoked fish research program; standards and specifications for fishery products; survey instru-

ment development; transportation of fishery products; and water resource developments.

Commercial Fisheries Research and Development Act of 1964.—The States have responded well to the program established by the Commercial Fisheries Research and Development Act of 1964 (Public Law 88–309). As of December 31, 1966, 201 project proposals from 49 States had been approved for funding. Contracts that were awarded in 48 States have obligated about $5.2 million of fiscal years 1966 and 1967 Federal funds. The total State and Federal costs of project work completed or in progress is about $7.2 million.

The States participating in the program are conducting, either directly or through subcontracts, projects dealing with resource ecology; improvement of fishing gear and methods; propagation of commercial species; fish processing and product development; marketing; economics research; extension services; construction of laboratories and vessels; and collection and dissemination of statistics.

In each of fiscal years 1966 and 1967, $4.1 million was appropriated for Section 4(a) of the Act, which provides aid to States on a cost–sharing basis. Projects funded under this Section are at either a 50–percent or a 75–percent level of Federal participation.

Funds provided under this Act, now in its second full year of operation, are enabling the States to develop and use more fully their research and development capabilities which, together with the Federal effort, will bridge many gaps in our knowledge of fishery resources. This will lead to an improvement in the total effort to conserve the resource and strengthen the economic status of the industry.

Cooperatives.—The Bureau advises and assists many fishery cooperatives. Its personnel in 1966 helped organize cooperatives in Alaska, Florida, and Massachusetts. The personnel also found the existing cooperatives had complied satisfactorily with the Fishery Cooperative Marketing Act of 1934.

U.S. fishery cooperatives in October 1966 numbered 102, with 10,124 members operating 7,514 craft. The cooperatives provided more services for their members and increased the volume of fishery products marketed.

Foreign countries, especially developing ones, were deeply interested in the cooperative movement. Inquiries and requests for assistance came from several U.S. and international organizations

dedicated to the cooperative movement and from various foreign governments.

Economic situation and outlook reports.—A new series of reports on the economic situation and outlook for various fishery commodities were released in 1966 to the public. Four issues of this series each year are devoted to shellfish and another four to food fish. Prices, landings, production of processed products, imports, exports, and inventories are analyzed to obtain a picture of probable market conditions and price movements in the future. These reports are designed to help the fishing industry make decisions on short–run and intermediate production, distribution, and pricing. They also assist personnel in Government and related industries who make decisions in the planning and management of their areas of interest or responsibility. Thirteen hundred industry people from 44 States, the District of Columbia, and a considerable number of Government officials have asked to receive these reports regularly.

Exploratory fishing in fresh water.—The Bureau's field station at Kelso, Ark., further improved the capabilities of the haul seine system used to harvest fish from the rice farm ponds. Catches of up to 35,000 pounds of catfish were taken from ponds with a special mechanical seine–rope puller. This system has contributed greatly to the rapidly expanding commercial fishery in ponds in the central and southern States. A project is under way in Kelso to develop a system to move fish out of ponds into a harvest area by some method other than the haul seine.

Fishery product publicity.—To increase sales of fishery products, the Bureau used newspaper, radio, and television coverage; demonstrated fish cookery techniques; developed and distributed free recipes; developed and published recipe booklets for sale; and circulated films.

Through contact with food editors of newspapers and magazines, the Bureau obtained over 74,000 column inches of space in these publications, which have a total readership of over 300 million subscribers or purchasers. It is estimated that during 1966 this material reached the average consumer 4½ times. This estimate does not mean that each consumer read this information; it means that the exposure was equal to this figure.

Bureau marketing representatives during 1966 arranged several hundred radio and television public service shows. These programs were mostly interview shows in which representatives of the Bureau or fishing industry informed the public about fishery

products; preparation techniques, best buys, and availability of Bureau publications.

The Bureau's home economists developed and tested 633 institutional, school lunch, restaurant, and consumer recipes in 1966. These recipes were distributed to institutional dieticians, school lunch supervisors, restaurant chefs, and magazine and newspaper food editors throughout the country.

The Bureau also developed and offered for sale through the U.S. Government Printing Office three colored recipe publications, "The letters from the captain's wife," "Fancy catfish," and "Seafood slimmers." These publications were offered also through newspaper, radio, and television publicity, and fish cookery demonstration programs.

The Bureau also began production of a film on trout for the U.S. Trout Farmers Association and one on menhaden for the National Fish Meal and Oil Association.

Two hundred cooperating film libraries make national distribution of Bureau–produced fishery educational films. During 1966, 150 prints of the sardine film, "Flavor of Maine," produced by the Bureau in 1965 for the Maine Sardine Council, were deposited and circulated in the libraries' distribution system. Exclusive of television audiences, more than 3 million persons in 1966 viewed films on 22 different subjects.

Fishery statistics.—Annual commercial fishery data on each of the 47 States that have commercial fisheries were assembled. These data include the number of fishermen and fishing craft, catch by gear, volume, and value of the catch, production of manufactured fishery commodities, and foreign trade in fishery products. Monthly landing bulletins for 19 States were issued in cooperation with the State fishery departments. Information was released monthly on freezing and cold storage holdings of fish and shellfish, and on the production of fish meal, oil, and solubles. Quarterly reports on the monthly production of fish sticks and portions and breaded shrimp also were issued.

Inspection and certification program.—The Bureau provided 40 processing plants with continuous inspection and certification services of fishery products in 1966. These services are on a reimbursable basis. Sixty Federal inspectors examined 230 million pounds of fishery products. The eight lot inspection offices throughout the United States provided inspection services for 22 States and various municipal, State, and Federal agencies that use Bureau inspection in procuring fishery products.

The inspection program also provided industry with more economical inspection services. Twenty–eight inspectors from other Federal inspection agencies were cross–licensed to sample and inspect the quality and condition of fishery products. A mobile inspection laboratory was again operated in the Gloucester, Mass., area to provide on–the–spot inspection of fishery products for firms within a 100–mile radius.

Market News Service reporting.—The Market News Service continued to provide the U.S. fishing industry with current information on landings, receipts, prices, demand, markets, stocks, imports and exports, and new developments in domestic and foreign fisheries.

Fishery Products Reports are issued daily by seven Market News Service offices at Boston; New York City; Hampton, Va. (includes data from Baltimore, Md.); New Orleans; Chicago; San Pedro, Calif.; and Seattle. The field offices also issue monthly and annual summaries of market news data and special market reports.

Marketing cooperators sought.—Bureau marketing personnel in 1966 continued working with several national firms that manufacture products complementary to seafoods. National publicity obtained by linking fishery products to allied products, including sauces, spices, fruits, pastry products, metal foils, and beverages, and to home economics courses of utility companies, resulted in a great deal of favorable publicity for the fishing industry. The importance of working relations between the Bureau and producers of products allied with fish has long been recognized. Because of the Bureau's contacts, several firms handling allied products developed television, newspaper, and in–store tie–in publicity materials. Bureau representatives arranged also for placing several thousand point–of–sale materials (posters, signs, and pictures) in retail outlets throughout the country. Cooperators paid for the materials.

National Anadromous Fish Program.—The States have responded well to the National Anadromous Fish Program, established by the Anadromous Fish Act (Public Law 89–304) of October 30, 1965. Fifteen States during 1966 submitted 30 projects. These anadromous fish projects include studies of biology, use of stocks, population size, abundance indexes, migratory habits, restoration and rehabilitation of runs, and construction of hatcheries, egg–taking stations, and fish screens. The total first–year cost of these projects, including the States' share, is $1,200,960.

In fiscal year 1967 (which began July 1, 1966), $1 million

was made available to the Bureau as matching funds for the 31 States bordering the Oceans and the Great Lakes.

The Act, administered jointly by the Bureau and the Bureau of Sport Fisheries and Wildlife, authorizes Federal appropriations up to $25 million through June 30, 1970, for conservation, development, and enhancement of the Nation's anadromous fish resources. The Act also includes Great Lakes fishes that spawn in streams tributary to the Lakes. Under the Act, Federal funds may be used to finance up to 50 percent of project costs.

Oil and gas activities.—The Bureau in 1966 continued close liaison with State and Federal agencies concerned with explorations for oil and gas on the Outer Continental Shelf. Of special interest to commercial fisheries are seismic and drilling operations in fishing areas. Santa Barbara Channel off the southern California Coast and Georges Bank off the New England Coast are two areas where such operations may interfere with fishing.

Pesticide surveillance.—Scientists of the Bureau's Biological Laboratory at Gulf Breeze, Fla., in cooperation with researchers in State and university agencies, measured the concentration of pesticides in representative fish species from about 200 sampling stations in 15 States and the Great Lakes. The observations generally indicated relatively low levels of chlorinated hydrocarbon compounds. In some areas and seasons, however, the amount in fish and shellfish increased greatly.

Pollution studies.—Estuarine, pesticide, and radiobiology studies at the Bureau's Biological Laboratories at Beaufort, N.C., Gulf Breeze and St. Petersburg, Fla., and Galveston, Tex., are providing basic information on environmental requirements of many commercial fish and shellfish and the effects of pollutants upon them. This knowledge is important for developing fish and shellfish farming operations and for protecting estuarine areas that are vital to the well–being of about 75 percent of the marine species used for food.

Smoked fish research.—Data obtained by the Bureau in its program to develop safe and practical processing methods for smoked fish have been made available to the fishing industry. The Department of the Interior and the Public Health Service of the Department of Health, Education, and Welfare jointly published a sanitation manual for smoked fish establishments. These agencies are reviewing two manuals. One describes a safe processing method for smoked fish that was developed from recent Bureau research. The other gives a guideline for shipboard handling of fish destined for use as smoked fish.

Standards and specifications for fishery products.—Another standard was added in 1966 to the voluntary U.S. standards for grades for 14 fishery products. The Bureau developed these standards after 1956 at the request of the fishing industry. The U.S. Department of the Interior's voluntary inspection and certification service bases its grading program on these standards. The latest standard is for frozen headless dressed whiting.

Other activities included work on a proposed standard for grades of frozen raw sea scallops. This standard will contain quality assurance provisions as used in military specifications. Work was completed also on the NASPO (National Association of State Purchasing Officials) fish specification for shucked oysters and clams.

Survey instrument development.—The Bureau's Oceanographic Instrumentation Program, Washington, D.C., helped Bureau biological laboratories develop instrument systems for their research. The Program assisted the Bureau Laboratory at Stanford, Calif., with instruments for measuring water temperatures at the surface and in the depths; the California Current Resources Laboratory at La Jolla with plankton samplers; and the Bureau's Biological Laboratory at Woods Hole, Mass., with the bathykymograph for fish nets. The Program also worked extensively to establish various applications of satellite technology in fishery research and evaluation.

Transportation of fishery products.—Work on transportation of fishery products during 1966 centered around maintenance of adequate transport service. In other years the Bureau was concerned more with rates and charges and with maintaining fishery exemption from economic regulation for motor vehicles transporting fresh and frozen fish.

Fresh fish products used to be transported largely by railway express, but reduction in the number of passengers has reduced the express service. The Bureau is working with representatives of the fishing industry to find other methods for transporting fresh fish.

The Bureau staff gathered, tabulated, and analyzed information from truckers on fresh and frozen fish shipments from Massachusetts. A preliminary report of the results of this study was presented to the 1966 National Fisheries Institute Convention. The report showed a trend toward a slightly increasing number of pickups and dropoffs by truckmen hauling fresh and frozen fish.

Air carriers continue to be deeply interested in handling fresh fish. The Civil Aeronautics Administration permitted low exper-

imental rates from Seattle, Wash., to test the possibilities for increasing the shipments of fish by air and to ascertain if the airlines could handle these shipments at a profit. The tests showed that containers must be improved and that suitable ground facilities and methods of handling iced fish must be devised.

The Bureau staff participated in two regulatory proceedings in 1966. One proceeding was before the ICC (Interstate Commerce Commission) and the other before the FMC (Federal Maritime Commission). The former was ICC Docket No. MC–66562 et al., "Railway Express Agency, Incorporated, Petition for Removal of Rail–Haul Restrictions," and the latter FMC Docket Nos. 66–22 and 66–23, "Alaska General Increase in Rates—Peninsula and Bering Sea Areas of Alaska." In the ICC proceeding the Express Agency wants restrictions removed from its numerous certificates to operate motor vehicles intercity. The restrictions require a prior or a subsequent rail haul of the shipper's traffic. If the restrictions are removed, the Express Agency could use motor trucks from origin to destination on routes where good rail service no longer exists. Removal of the restrictions is important also to certain segments of the fishing industry to ensure that its perishable products continue to be sent to its established trade. Many localities cannot be serviced if the restrictions remain.

In the FMC proceeding canned salmon and other fishery product rates are involved.

Water resource developments.—Because the needs of our increasing population continue to grow, water resource developments are increasing also. Through its water resource coordinators and its river basin staff in Alaska, the Bureau helps evaluate how proposed water developments affect fish resources. The Bureau determines what is needed to maintain and increase the fish resources in face of the proposed developments. Of particular interest to the Bureau are the effects of proposed water development projects in the Columbia River Basin and in other parts of the Pacific Northwest.

The Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife have vigorously opposed for more than a year a proposed project in Florida that would change upper Old Tampa Bay into a fresh–water lake. The Southwest Florida Water Management District and the Hillsborough County authorities highly favor the project. If the project were carried out, these 17 square miles of productive marine habitat lying within Hillsborough and Pinellas Counties would be destroyed. Bureau efforts convinced most of the Pinellas County Commissioners of

the inadvisability of the project. Their opposition caused the Hillsborough County Commission to withdraw funds that had been reserved for carrying out the project.

Considerable Bureau effort was devoted also to coordinating studies on the Corps of Engineers' Texas Coast Hurricane project; one segment of the project includes the productive Galveston Bay area. Plans for this area were potentially disastrous to the fishery resources of the Bay. In a number of meetings with the Corps, a suitable series of scale–model tests were devised to provide answers that should satisfy both the Bureau and the planning agency.

The North Atlantic Region during 1966 reviewed and reported on many separate water resource development projects affecting commercial fishery resources. Most of the projects were associated with alterations of the estuarine and coastal environment by numerous proposed navigation, beach erosion control, and hurricane protection projects under Federal planning or under Federal permits.

Special studies were developed and policy and technical advisory committees established for conserving fishery resources associated with Storm King Mountain pumped storage projects, Hudson River, Cornwall, N.Y.; Canal Electric power plant, Cape Cod Canal, Sandwich, Mass.; and Chesapeake and Delaware Canal spoil disposal in Upper Chesapeake Bay, Md.

The Bureau participated in several framework "Type I" comprehensive studies on the Ohio, Missouri, and Upper Mississippi River Basins. The Bureau's portion of these studies involves existing and potential commercial fisheries within these extensive River Basins. Findings give information on demands for commercially valuable fish, analysis of the supply, and possibilities for managing the fisheries. In 1966, reports were completed on commercial fisheries in Lower Missouri tributaries, Yellowstone Basin, and Platte Basin; the 1965 Ohio Basin report was updated to include, among other things, material on the Basin's expanding mussel industry. The economics of the removal of rough fish in Minnesota lakes was analyzed further.

The Bureau also placed extensive input into the Federal Water Pollution Control Administration's developing study on the Great Lakes–Illinois River Basin Project. Comprehensive reports were completed on the commercial fisheries of Lakes Erie and Michigan, with particular emphasis on effects of present and future pollution.

Besides investigating the smaller but more imminent projects, the Bureau's River Basin Studies unit has a continuing program

of data gathering on effects of large–scale potential projects. On the Copper River, for example, alternative proposals call for either a 600–foot high or a 1,000–foot high dam at the Wood Canyon site. Over 1 million sockeye salmon were taken in 1966 in the commercial fishery in the Copper River district. To develop means of counting the salmon that pass the damsite, field parties at Wood Canyon captured salmon in fish wheels, marked the fish, and then recaptured them later on the spawning grounds. With the knowledge gained in 1966, the River Basins personnel can improve their sampling technique and obtain data that will lead to a statistically valid estimate of the number of fish reaching the spawning grounds.

In Portland, Oreg., the Bureau has a small staff of hydraulic engineers and biologists who participate in planning and designing fish facilities associated with water development projects on a nationwide basis. The staff participates in the planning and designing of large hatcheries on the Cowlitz River built in connection with the Mayfield and Mossyrock hydroelectric projects. It is concerned also with another large hatchery being planned for the Dworshak Project on North Fork, Clearwater River, Idaho. Evaluations are under way at the Mayfield, Round Butte, Cougar, and Fall Creek projects to determine the adequacy of fish facilities, particularly those designed to collect and pass the small fish that are migrating downstream. The staff frequently inspected the construction of major fish facilities at John Day, Wells, and Hells Canyon projects in the Columbia River Basin. The staff inspected and made plans for evaluating the recently completed facilities at Fall Creek Dam in the Willamette system and the reconstructed fishways at Lewiston Dam on the Clearwater. The staff closely watched the new fishway at Willamette Falls during the critical early stages of construction and represented the Fish and Wildlife Service in giving advice on fish passage and fish protective facilities for several projects in eastern United States. Paramount among these projects in eastern United States are the Storm King Mountain Project on the Hudson, Tocks Island Dam on the Delaware, and Turner Falls on the Connecticut. The staff also suggested a plan for fish passage and propagation for the Wood Canyon Project on the Copper River in Alaska.

Fisheries Financial Assistance Programs

The Bureau in fiscal year 1966 continued to administrate its

three loan programs to aid the U.S. fishing industry. The activities of these programs are summarized below.

Fisheries Loan Program

The Fisheries Loan Program continued operations that began in the latter part of 1956. Public Law 89–85, enacted July 1, 1965, authorized continuation of this Program. This Law extended the life of the Fisheries Loan Fund to June 30, 1970, and expanded the purposes for which loans may be made. The primary change provided procedures for financing or refinancing the cost of purchasing or constructing a new or used commercial fishing vessel. During fiscal year 1966, 186 applications totaling $3,724,525 were received and 92 for $1,912,895 were approved. The total since the Program began is 1,830 applications for $46,458,719, and of these, 957 for $21,119,566 have been approved (app. C).

Fishing Vessel Construction Differential Subsidy Program

Public Law 86–516 authorized the Fishing Vessel Construction Differential Subsidy Program that began in 1960, and Public Law 88–498, approved August 30, 1964, amended P.L. 86–516. This legislation modified the Subsidy Program and increased the amount of subsidy that may be paid from 33–1/3 to 50 percent of the domestic cost. To carry out the purposes of the Act during fiscal year 1966, an appropriation of $5 million was made. A vessel must meet certain requirements to be eligible for a subsidy. It must be of advanced design that will enable it to operate farther from port, be equipped with newly developed gear, and must not operate in a fishery if such operation would cause economic hardship to efficient vessels already in that fishery. A public hearing is required on each application before a finding of eligibility can be made. After regulations were adopted in December 1964, the first applications under this revised Program were received. Under the expanded Program as of June 30, 1966, the Bureau received 69 applications for subsidies estimated at about $16,867,000. Of these, 37 were from New England, 11 from the Gulf Coast area, 15 from California, and 4 from Seattle, Wash. Forty of these applications were approved after hearings, and construction of eight subsidized vessels was begun by the end of fiscal year 1966.

Fishing Vessel Mortgage and Loan Insurance Program

The Fishing Vessel Mortgage and Loan Insurance Program was continued during fiscal year 1966. This Program provides for

Government insurance of mortgages given for construction, reconstruction, or reconditioning of fishing vessels. During the year 45 applications for insurance totaling $2,908,253 were received, bringing the total applications to 122 for $10,378,245. Thirty applications involving $1,870,689 were approved during the year, and 16 for $1,785,600 were pending on June 30, 1966. Since this Program began in 1960, the Department of Interior has approved 93 for a total of $6,721,656. Vessel owners and lending agencies continued to be interested in this Program.

American Fisheries Advisory Committee

Most members of the American Fisheries Advisory Committee are from the fishing industry. Under provisions of the Saltonstall–Kennedy Act of July 1, 1954, the Secretary of Interior appoints them. They give him advice and recommendations on formation of policy, rules, and regulations relating to requests by industry for assistance and other matters considered appropriate by the Committee Chairman. The Committee met in 1966 in Washington, D.C., May 9 and 10 and in Irvington, Va., October 24 to 26.

Appendix D lists the Committee members of 1966.

New Programs

In 1966 the Bureau began several new research programs. One program seeks to determine the optimum shrimp fishing effort in zones in the Gulf of Mexico. Another program is the study of the anchovy. Other new programs are EASTROPAC (an international cooperative oceanographic study of the eastern tropical Pacific); economic analysis of the relative efficiency of certain fishing vessels; economic feasibility of establishing a fish block industry in the Pacific Northwest and Alaska; and studies on harvesting Pacific Northwest pelagic fish. Still other new programs are the Man–in–the–Sea Program; Missouri River tailwater studies; planning, programming, budgeting, and evaluation system; salmonid loss assessment; spacecraft oceanography; and techniques for successful fish farming.

Analysis to Determine Optimum Shrimp Fishing Effort in Zones in the Gulf of Mexico

The Bureau in 1966 began a cost analysis of fishing from various ports on alternative fishing grounds. In the Gulf of Mexico shrimp fishery, the size of shrimp taken corresponds directly to

the fishing zone in which they are caught. The basic problem in this fishery is obtaining maximum economic returns over time. Will fishermen, for example, be better off in the long run to fish in shallow zones where the cost is less and catch small shrimp that have a lower value or in deeper water where shrimp are more dispersed and more costly to catch but are larger and more valuable?

Anchovy Studies

Much new information is needed on the biology and population dynamics of the increasingly abundant northern anchovy of our Pacific Coast if the resource is to be used effectively and conserved adequately. Fishery scientists have estimated that its total population off our Pacific Coast has been estimated at 5 million tons and its potential annual harvest at 200,000 to 500,000 tons, worth $4 to $10 million to the fishermen.

To obtain this information, a cooperative study of the anchovy has been started. The Bureau's California Current Resources Laboratory at La Jolla participates in it. The participants will study the abundance and distribution of anchovy eggs, juveniles, and adults. They also will delimit anchovy spawning areas, tag them, define their subpopulations, and determine rates of fecundity and mortality. The California Cooperative Oceanic Fishery Investigations, in which the Bureau is an active participant, will watch closely the anchovies to determine possible effects on stocks of the new reduction fishery, which the State of California authorized for the first time in the 1965–66 season and approved for the 1966–67 season.

EASTROPAC

The basic planning for EASTROPAC, an international cooperative oceanographic study of the eastern tropical Pacific, was completed in 1966. Full-scale field work is to begin early in 1967 and continue for about 18 months. The Bureau's Tuna Resources Laboratory at La Jolla, Calif., employed a Coordinator for EASTROPAC. The principal aim of EASTROPAC is to improve our knowledge of the oceanography and the fishery resources of a broad region of the equatorial and southeastern Pacific; much of this region is outside the present major fishing grounds. The work plan is to carry out physical, chemical, and biological surveys in a region between the Coast and long. 126° W. and from lat. 20° S. to 30° N. These surveys will be followed by exploratory fishing in areas that the oceanographic studies have shown

to be most productive. Yellowfin tuna stocks in the eastern tropical Pacific show definite signs of overfishing, and new sources of tuna are required to maintain the industry in a healthy condition. Skipjack tuna offer the most promise and will receive special attention in the investigations. Other U.S. agencies and institutions, Chile, Peru, and Ecuador will participate in EASTROPAC.

Economic Analysis of the Relative Efficiency of Certain Fishing Vessels

The Bureau began a comparison of the economic efficiencies of certain fishing vessels in the foreign fleet and in the Boston offshore fleet. The New England fishing industry lags far behind foreign fisheries in developing and using highly efficient vessels and gear to catch fish and store and process them aboard ship. Information on some of these new techniques will be obtained through a research contract the Bureau has with Sea Fishery Institute, Gdynia, Poland. The Bureau will analyze engineering and cost data obtained under the contract. The analysis should provide domestic fishermen and investors with information that will encourage them to obtain the type of vessels and gear necessary to improve the efficiency of the New England fishing industry.

Economic Feasibility of Establishing a Fish Block Industry in the Pacific Northwest and Alaska

Despite the rapidly expanding domestic market for fish sticks and fish portions, nearly all the raw material for these products—frozen fish blocks—is imported. In the northern Pacific, a large number of fish of species suitable for manufacturing into fish blocks are underutilized. The domestic industry is apparently uncertain whether it is profitable to produce fish blocks.

A new Bureau study will establish industry guidelines for determining relative prices and costs that must prevail if the Pacific Northwest and Alaska fishing industry is to compete profitably in the manufacture of fish blocks. The Bureau personnel will estimate costs of processing fish blocks under commercial conditions on the West Coast. They will relate these costs to the prices for fish blocks imported into the United States and will estimate prices that are feasible for raw fish to be used in fish blocks. In addition, Bureau personnel will study available exploratory fishing and biological data to determine which underutilized species are available and estimate whether they could be caught and landed at prices that would permit their use in domestic blocks. If such

a fishery is feasible, a study will be needed to ascertain the possible market area within which these blocks can compete.

Harvesting Pacific Northwest Pelagic Fish

The Bureau's Exploratory Fishing and Gear Research Base in Seattle, Wash., began a program to develop techniques for harvesting anchovy, saury, and other pelagic fish. Midwater trawl gear and methods now used to catch Pacific hake have been adapted for the pelagic fish fishery.

Man–in–the–Sea Program

Progress of the U.S. Navy in saturation diving and use of submerged habitats has convinced the Bureau that these new techniques can be used in fishery and oceanographic research. The Bureau's Environmental Oceanographic Research Program, Washington, D.C., made arrangements for the Bureau to cooperate in the SeaLab III experiment, which is part of the Navy's Man–in–the–Sea Program. SeaLab III is scheduled to be established at a depth of about 430 feet off southern California in the latter part of 1967. Three Bureau scientists completed the first phase of the training required by the Navy for the experiment. The experience of these scientists should be extremely valuable to the Bureau.

Missouri River Tailwater Studies

The Bureau's Mobridge, S. Dak., field station began studies of the Missouri River tailwater below the Oahe Dam. The staff will work cooperatively with personnel from the Bureau of Sport Fisheries and Wildlife, U.S. Corps of Engineers, and State of South Dakota. The Bureau vessel *Hiodon* was transferred in November 1966 from Oahe Reservoir to the tailwater area to perform experimental trawling. Specially designed gill nets have been made and sampling of the fish population has begun.

Planning, Programming, Budgeting, and Evaluation System

In response to the "Statement by the President to members of the Cabinet and Heads of Agencies" (via Bureau of the Budget Bull. 66–3), the Bureau established a Planning, Programming, Budgeting, and Evaluation System (so–called PPB). Such a management improvement project was not entirely new to the Bureau, for a considerable amount of effort had been devoted already to an evaluation of Bureau plans.

The Bureau established a full–time planning group to devote its full attention to PPB. This Program Planning Staff is led by an Assistant Director for Planning. It is a full–time independent analytical group that is attached to the Director's Office as an advisory group. It is composed of experienced personnel with varied and complementary backgrounds. This group is responsible for:

1. The systematic and continuing definition and revision of Bureau goals in response to emerging national needs that are pertinent to the mission of the Bureau. This task involves the comprehensive analysis of major factors, current and prospective, that influence the changing pattern of these national needs.

2. The systematic development and analysis of plans and programs designed to make the Bureau most effective in achieving its goals, with due regard for domestic and international trends and conditions within the industry and the economy as a whole.

3. The definition of broad programs for the Bureau.

4. The development of recommendations for maintaining sound relations between program priorities and level of effort as conditions change.

Members of the Program Planning Staff work closely with the Bureau's top management and others. They participate in staff meetings and confer with the Director, the Assistant Directors, and the Regional Directors. Some contact is maintained with personnel in the academic field, also. The staff presents recommendations, suggestions, and views for considerations, decision, and action. The staff also maintains contact with officials in other Bureaus of the Department, in other agencies of the Government, and in the fishing industry.

Conversely, the Bureau's top management actively participates in the planning, programming, and reviewing. It provides guidance, ideas, and information to the planning group, and, when that group has developed recommendations for action, top management sets policy.

Salmonid Loss Assessment

The Bureau's Biological Laboratory at Seattle, Wash., began a program to assess the loss of adult salmonids at each dam on the Columbia and Snake Rivers and to obtain information on where and how the mortalities occur. Such information will be valuable in devising methods to reduce the losses.

Spacecraft Oceanography

Programs are under way at the Bureau's Biological Laboratory at Galveston, Tex., and Exploratory Fishing Base at Pascagoula, Miss., to determine the feasibility of using manned spacecraft to obtain information about the natural resources and phenomena of the earth. The Navy Oceanographic Office, under contractual agreement with the National Aeronautics and Space Administration, is the focal point for spacecraft oceanographic investigations. Personnel at both Bureau installations provide the Navy Oceanographic Office with technical assistance on biological and fishery oceanography. Spacecraft may offer significant opportunities in man's quest for knowledge and use of the ocean. Immediate emphasis is being placed on use of systems involving existing or modified equipment aboard the spacecraft. Present programs are concerned with determining what relations can be found between observations made by the spacecraft and the physical, geological, and biological conditions of the world ocean. Particular emphasis is on determination of sea surface temperatures, current patterns, sea state, shoaling processes, bioluminescence, and productivity. Sensing devices being tried involve photography, radar, infrared, passive microwave, and spectroscopy. Under investigation also is the use of satellites as data relay telemetry links between buoy networks and ground stations. This information will be particularly useful to people involved in fisheries, shipping, cartography, pollution control, and weather studies.

Techniques for Successful Fish Farming

The Bureau began a study in 1966 to make an economic model for fish farming operations. The model will enable Bureau personnel to estimate the best pattern for stocking, feeding, replenishing the water, and harvesting the fish for different product and factor prices.

Meetings

Bureau officials participated in certain international conferences and meetings chiefly to urge policies that would benefit the U.S. fishing industry. Their participation included presentation of scientific reports and preparation of background papers, position papers, and similar studies for U.S. representatives. Subjects discussed at these meetings included vessel designs for Canada's Atlantic offshore fisheries; progress in fisheries, marine, and fresh–water science in the Pacific; conduct of fishing opera-

tions in the North Atlantic; improvement of international cooperation in fisheries, including increased fisheries training, resource management, more and better statistics, marketing surveys, preinvestment studies, and improved liaison with international organizations; sea lamprey control and lake trout rehabilitation; preparation and presentation of technical papers on Gulf and Caribbean fisheries; improvement of marine food resources for Southeast Asia; determination of a tuna catch quota in the eastern tropical Pacific; regulation of gear used in the International Commission for the Northwest Atlantic Fisheries area, capture of haddock, and regulation of fishing effort; conservation of Atlantic tunas; harvesting of northern North Sea herring stocks; working conditions of fishermen; halibut fishery regulations in the eastern Bering Sea; halibut stocks and the expanding trawl fisheries in the Gulf of Alaska; conservation of salmon resources; whaling conservation measures; fur seal research and management activities; and review of the work plan of the Caribbean Fisheries Development Project. A summary of the work done at these meetings follows.

Canadian Atlantic Offshore Fishing Vessel Conference

About 300 participants, including naval architects, fishermen, fishing vessel owners, fishery administrators, and others allied with the fishing industry, attended the Canadian Atlantic Offshore Fishing Vessel Conference, February 7 to 9, 1966, at Montreal, Canada. Two Bureau scientists were among the participants. The Federal–Provincial Atlantic Fisheries Committee, composed of the Governments of Quebec, Nova Scotia, New Brunswick, Newfoundland, Prince Edward Island, and Canada, sponsored the Conference. The purpose of the Conference was to stimulate development of vessel designs particularly suited to specific requirements of Canada's Atlantic offshore fisheries through consideration and correlation of available data relating to design of fishing vessels over 100 gross tons with a view to developing improved concepts.

Eleventh Pacific Science Congress

Twelve Bureau scientists attended the Eleventh Pacific Science Congress in Tokyo August 22 through September 10, 1966. They became better acquainted with the progress being made in fisheries, marine, and fresh–water science in the Pacific area.

Fisheries Policing Conference, London

Representatives of 18 countries fishing in the North Atlantic met in London March 31 to April 6, 1966, and October 17 to 29, 1966, to draft a convention on the conduct of fishing operations in the North Atlantic. The countries represented at these meetings were Belgium, Canada, Denmark, France, Federated Republic of Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, U.S.S.R., United Kingdom, and United States.

A preliminary conference was held April 6 to 9, 1965, to determine possible areas of agreement and conflict and to develop an agenda for a more formal and extensive conference to be held March 31 to April 6, 1966. The 1966 meeting worked through Articles 1 to 9 and Annexes I to V of a first working draft of a proposed convention containing 21 articles and 7 annexes.

A second working draft of the proposed convention and comments that various countries had submitted in the interim were distributed to the delegates before the October 1966 meeting. No formal agenda was prepared for the October meeting, but the second working draft was used as the basic discussion document.

Considerable progress was made at the October meeting. Representatives agreed on the Articles concerning marking of fishing vessels, light signals for fishing vessels, marking of nets and other gear in the sea, code of good conduct on fishing grounds, and conciliation procedure to facilitate settlement of small claims arising out of gear damage. The most controversial subjects were delimitation of the Convention area, liability of trawlers, and enforcement. All Articles and Annexes were to be open for discussion at the next meeting early in 1967.

FAO (Food and Agriculture Organization of the United Nations)

Committee on Fisheries session.—At its first session in Rome June 13 to 18, 1966, the FAO Committee on Fisheries, established in 1965 by resolution of the 13th Session of the FAO Conference to advise the FAO Council on fishery matters, gave top priority to improvement of international cooperation in fisheries. Other priority problems identified by the Committee and noted for early consideration were fishery education and training; effective use of fishery resources, particularly for human consumption; study of economic aspects of fishery management; and marine pollution.

Fishery administrators from all parts of the world attended the Committee's first session. Represented were 29 of the 30

member countries; 19 other countries and 6 international organizations sent observers.

Council Session.—At its 47th Session in Rome October 17 to 29, 1966, the FAO Council was generally satisfied with the program and growth of FAO's Department of Fisheries. Several developing countries appealed for more technical assistance in the field and for more subregional offices. Delegates also suggested the need for more work on fishery training, resource management, more and better statistics, marketing surveys, preinvestment studies, and improved liaison with international organizations.

Great Lakes Fishery Commission

At its 11th annual meeting June 21 to 24, 1966, at Sault St. Marie, Canada, the Great Lakes Fishery Commission reported that the number of adult lampreys taken at assessment weirs on Lake Superior had declined from 8,104 in 1965 to 3,457 in 1966. The most significant change occurred in the Brule River in Wisconsin where the run declined by 96 percent. Because of the continuing decline in sea lamprey populations, the Commission agreed to change the schedule of stream treatments, which was based on the potential for lamprey production rather than a set time schedule. Scientists believe the new schedule will result in a more efficient and effective control program.

Lake trout stocks in Lake Superior continued to increase, and limited natural reproduction is occurring. Scientists believe that in the next few years the number of mature spawning trout will increase, as will the rate of natural reproduction.

One of the more difficult problems discussed was the State of Ohio's proposal to increase size limits on walleye in Lake Erie from 13 inches to 15½ inches. The Province of Ontario stated that it would maintain the 13–inch size limit. The Commission did not make a recommendation on the appropriate size limit and called for additional research to determine the optimum size limit. Ohio commercial fishermen have not objected strongly to the proposed increased size limit, and some segments of the industry favor it.

State of Minnesota representatives were concerned over the continued high rate of lake trout scarred by lampreys in the Minnesota waters of Lake Superior. Bureau scientists said a thorough survey of potential lamprey–producing streams in Minnesota would be made soon. No satisfactory reason was given for the high scarring rate—past surveys of the area have failed to find any major lamprey–producing streams.

The Commission agreed to a recommendation of the Lake Huron subcommittee to limit plantings of Lake Huron to splake (a brook trout–lake trout hybrid) and not lake trout. Splake should spawn when 3 years old before they are severely affected by lampreys and would probably establish themselves despite some predation by lampreys.

The Commission agreed also to the sea lamprey committee recommendation to remove the remaining three electrical barriers on Lake Michigan, which are not important for assessing lamprey populations. Their removal will save the Commission $17,000 a year.

The Commission agreed to ask the Governments of Canada and the United States to give the Commission information on the pollution control and water quality studies that are being made by various agencies of these Governments. This information will help the Commission in its program of fishery research and lake trout rehabilitation, especially in Lakes Erie and Ontario where the Commission is expanding its investigations of fishery problems.

Gulf and Caribbean Fisheries Institute

At the 19th annual session of the Gulf and Caribbean Fisheries Institute November 14 to 17, 1966, in Miami, Fla., Bureau personnel prepared and contributed almost half of the technical papers presented. (These papers are listed by authors' names in Appendix H of this report.) Bureau personnel participated also in the discussion panels for the four daily sessions. Of the almost 200 people registered for the meeting, 50 came from the Caribbean and Central and South American areas.

Indo–Pacific Fisheries Council

The Indo–Pacific Fisheries Council of the Food and Agriculture Organization of the United Nations at its 12th meeting in Honolulu October 3 to 17, 1966, worked on a program to improve marine food resources for Southeast Asia. Member nations of the Council represented in Honolulu were Australia, Ceylon, France, India, Japan, Korea, Malaysia, New Zealand, Philippines, Thailand, United Kingdom, United States, and Vietnam. Member governments not represented at the meeting were Burma, Cambodia, Netherlands, and Pakistan.

A 2–day symposium on fishery education and training was devoted in part to papers describing training programs throughout the world. One result was the recommendation that the Indo–Pacific region have one or more educational centers to train ex-

tension officers, who could then train fishermen directly. These officers would also provide member nations with training information and advice.

A number of other actions were taken. The Council appointed a committee, scheduled to meet in Rome in October, to discuss programing and coordination of investigations of the Indian Ocean's fishery resources. The Council also considered Hawaii's needs for new fish species to enrich its fauna and suggested several kinds that might be introduced there. The Council decided also to promote the preparation of a multilingual manual to identify commercially important species of the Indo–Pacific region. The manual will consist of cards—carrying pictures and local names of fishes—that can be used by fishery officers and fish dealers. The use of these cards will facilitate collection of more reliable statistics.

Inter–American Tropical Tuna Commission

The Inter–American Tropical Tuna Commission at its annual meeting in Guayaquil, Ecuador, April 19 and 20, 1966, adopted a resolution for managing and conserving the yellowfin tuna resources of the eastern Pacific Ocean. The Commission recommended that its members (Costa Rica, Ecuador, Mexico, Panama, and the United States) (1) establish a prescribed tonnage limit on the total catch of yellowfin tuna by the fishermen of all nations during each calendar year from an area of the eastern Pacific Ocean earlier defined by the Commission; (2) establish open and closed seasons for yellowfin tuna under prescribed conditions; and (3) permit the landing of not more than 15 percent by weight of yellowfin tuna among the tuna fishes taken on a fishing trip made after the close of the yellowfin tuna fishing season.

These recommendations were carried into effect so far as they affected vessels and persons subject to the jurisdiction of the United States by the regulations made effective by the Department of the Interior September 15, 1966. The 1966 yellowfin season was closed on that date, and fishing vessels of the United States departing on fishing trips thereafter were not permitted to retain in possession or land quantities of yellowfin in excess of 15 percent of other tuna (principally skipjack) taken on such fishing trips. These restrictions were to remain in effect until the yellowfin season reopened January 1, 1967.

At this meeting also the Commission recommended a quota of 79,300 tons for the 1966 yellowfin tuna fishery. Because of dif-

ficulties in getting the Commission's recommendations under way, the catch, however, was 90,800 tons.

ICNAF (International Commission for the Northwest Atlantic Fisheries)

Annual meeting.—Almost 2 weeks of preliminary scientific meetings preceded ICNAF's 16th annual meeting June 5 to 11, 1966, in Madrid. At the preliminary meetings many items of substantive interest to ICNAF were discussed and reports prepared for the Commissioners. The data upon which the discussions and reports were based had been submitted by member countries since the last annual meeting.

Items of special concern to the United States were the topside chafing gear problem, U.S.S.R. capture of haddock in ICNAF Subarea 5, and regulation of fishing effort.

ICNAF had been unable to effect needed mesh regulations for several years. These regulations had been earlier agreed to by most ICNAF Contracting Governments but had been accepted only with reservations by the United Kingdom, the U.S.S.R., and Poland, who took the position that the regulations should not apply to chafing gear used by stern trawlers. These countries, especially the U.S.S.R., use many stern trawlers in the ICNAF Convention area and require chafing gear to prevent their nets from bursting from the large catches taken by stern trawlers. The problem was that the proposed regulations required stern trawlers to use a type of chafing gear which the Commission approved, and the countries concerned had been unable to adopt chafing gears which met the approval of the Commission, and found it economically difficult to continue fishing without chafing gear. After considerable discussion, a new type of chafing gear developed by Poland was accepted by the Commission and Poland agreed to withdraw its reservation. The U.K. agreed to withdraw its reservation if the U.S.S.R. did likewise, and the U.S.S.R. agreed to test the Polish gear and, if it proved satisfactory, to convert to this gear and to withdraw its reservation.

The U.S.S.R. capture of haddock in ICNAF Subarea 5 (Georges Bank, just off New England), another item of serious concern to the United States, rose from 6,031 tons in 1964 to 90,070 tons in 1965. This catch was more than the combined catch of haddock from Subarea 5 by both Canada and the United States. The U.S.S.R. delegation acknowledged that they had begun a fishery for haddock in Subarea 5 during the latter part of 1965 (their prior catches were made incidental to capture of other species) and claimed to be using regulation gear. They said they had col-

lected no samples of commercially caught haddock in Subarea 5 in 1965, but would in 1966. They are to report on this fishery at the next ICNAF annual meeting.

The subject of regulation of fishing effort in the Convention area was discussed. This discussion was not new because most ICNAF members belong also to NEAFC (North East Atlantic Fisheries Commission) and this question had been considered in depth at the NEAFC annual meeting in May 1966. At the ICNAF and NEAFC meetings, the delegations agreed that it would be worthwhile to consider the topic of effort regulation, but no agreement was reached on how effort should be controlled.

The subject of using economic criteria in determining conservation regulations was also discussed and met with particularly divergent views. It was agreed that this subject should be generally discussed, and a working party of biologists and economists was appointed to study the subject and report to the next ICNAF annual meeting.

Working Group meeting.—The ICNAF Working Group for Biological and Economic Assessments of Conservation Actions at its meeting in London October 17 to 21, 1966, was charged initially with examining the economic and biological evaluation of various conservation measures that might be applied in the North Atlantic fisheries. Because stocks of some species in this area are heavily fished, the time may not be far distant when means will have to be found to fish these stocks rationally to ensure sustained, maximum benefits. To use the stocks most effectively, the resources must be maintained at optimum levels. Nations must not waste economic resources in fishing ineffectively, and thought must be given to avoiding excessive use of capital and labor (more vessels and men). Because these resources are a common property, discussion of how to best use them is vital.

International Convention for the Conservation of Atlantic Tunas

A Conference of Plenipotentiaries, sponsored by FAO (Food and Agriculture Organization of the United Nations) at Rio de Janeiro, Brazil, May 2 to 14, 1966, drafted an International Convention for the Conservation of Atlantic Tunas. Delegations attended from Argentina, Brazil, Canada, Cuba, Democratic Republic of Congo, France, Japan, Portugal, Republic of Korea, Republic of South Africa, Senegal, Spain, the U.S.S.R., United Kingdom, Uruguay, Venezuela, and the United States. The Federal Republic of Germany, Italy, and Poland sent observers.

Development of a draft Convention began in Rome, Italy, in

1963 when FAO convened a Working Party for Rational Utilization of Tunas in the Atlantic. The Working Party completed its assignment at a second meeting in Rome in July 1965. The Conference of Plenipotentiaries reviewed the draft prepared by the Working Party and altered the language where necessary to resolve differences of opinion.

The purpose of the Convention is to plan and coordinate scientific research on tunas and tunalike fishes in the entire Atlantic Ocean and adjacent seas so that these species will be maintained at levels permitting harvest at a maximum sustained yield.

The Convention covers all species of fish caught by tuna–fishing vessels, whether for food or other purposes.

After seven nations have signed and ratified the Convention, it will enter into force, and an international commission will be established.

ICES (International Council for the Exploration of the Sea)

At the 54th annual meeting of the International Council for the Exploration of the Sea in Copenhagen September 30 to October 12, 1966, its Comparative Fishing Committee discussed topside chafing gear and recommended additional research.

The Herring Committee reviewed the great increase in exploitation of northern North Sea herring stocks. It agreed that a 5– to 30–percent reduction from the 1965 catch (about 1 million tons) was desirable. Ad hoc groups were formed to plan further resource studies that will use acoustic methods, tagging, and more extensive larval surveys.

ILO (International Labor Organization)

Delegates from over 100 member governments attended ILO's June 1 to 23, 1966, annual International Labor Conference at Geneva, Switzerland. An item on the agenda was "Questions Concerning Fishermen," which the Conference referred to its Committee on Fishermen.

In considering this item, the Committee took action on three proposed international instruments that resulted from the Preparatory Technical Conference on Fishermen's Questions held October 18 to 28, 1965, by ILO at Geneva. The Committee adopted the (1) Recommendation Concerning Vocational Training of Fishermen, (2) the Convention on Fishermen's Certificates of Competency, and (3) the Convention on Accommodation on Board Fishing Vessels. A fourth item was added to the Committee's work when a Resolution concerning the Future Work of the Inter-

national Labor Organization on Fishermen's Questions was referred to it.

The Conference approved the Recommendation and the two Conventions. The Conventions will now be opened for ratification.

INPFC (International North Pacific Fisheries Commission)

At its 13th annual meeting November 7 to 11, 1966, at Vancouver, British Columbia, Canada, INPFC recommended fishing regulations for the halibut fishery in 1967 in the eastern Bering Sea. The Commission agreed to recommend a slightly longer fishing season in Area A and intensified conservation measures for areas east and west of it. The Commission will recommend also that an extensive area in southeastern Bering Sea—a nursery ground for young halibut—be closed to fishing completely. Within part of this area, Japan will try to prohibit all trawl fishing by its vessels. Canadian and United States representatives said their Governments intend to require their fishermen to release all halibut taken by trawl nets in any part of the Bering Sea. Japanese delegates said their Government intends to have a minimum size limit of 66 cm. (26 inches) for Bering Sea halibut.

In the Gulf of Alaska, the Commission studied how the expanding trawl fisheries for various species of bottomfish and shrimp affect the halibut stocks, which are harvested by Canadian and United States set–line fishermen. Groundfish catch statistics were exchanged, and scientists studied reports on numbers of halibut found in bottomfish trawl catches. The Commission approved recommendations of its Gulf of Alaska Groundfish Committee for further research in this field.

The Commission recommended that research on king crab in the eastern Bering Sea be continued and strengthened.

The Commission noted reports that the Republic of Korea (South Korea) may enter the salmon fishery and perhaps other fisheries in the Convention–covered area. The Commission asked its Chairman to call these reports to the attention of member governments, express the Commission's grave concern over implications of such action on its conservation program, and ask the member governments to consider the matter.

International Pacific Halibut Commission

At its 42d annual meeting February 1 to 4, 1966, at Seattle, Wash., the Commission reviewed the 1965 fishery and research and approved the research program for 1966 continuing the 1965 pro-

gram of tagging and assessing the possible effects of foreign fishing upon halibut stocks.

The Commission recommended to the Governments of Canada and the United States (the only members of the Commission) that the fishing season for Areas 1, 2, 3A, and 3B, the most important areas of the North Pacific, should begin May 9, 1966. The Commission also recommended quotas or closing dates of the fishing season if the quotas were not reached. The fishing season for Area 1, which is not subject to quota, would end when that for Area 2 ended. In Areas 2 and 3, the fishing season would end when the catch limit of 23 million pounds (for Area 2) and 33 million pounds (for Area 3) had been reached or on October 15, whichever is earlier. In Area 3 the fishing season would close when the catch limit of 3.5 million pounds had been reached or on November 15, whichever is earlier.

Because these Areas attained their quotas, the fishing season for Areas 1 and 2 ended August 25; for Area 3A, August 15; and for Area 3B, September 17.

International Pacific Salmon Fisheries Commission

At its 1966 annual meeting in December at Bellingham, Wash., the International Pacific Salmon Fisheries Commission considered steps that could be taken to prevent prespawning mortality of sockeye salmon on the Horsefly River. It approved a three–step program consisting of (1) construction of the McKinley Creek temperature control project as a pilot operation, (2) further consideration of the possible construction of a fishway at Horsefly Falls, (3) consideration of the possible building of the Crooked Lake temperature control works after the McKinley Lake project has provided adequate justification. The report of the Commission, which contained this program, was forwarded to the Governments of Canada and the United States for consideration.

IWC (International Whaling Commission)

At its 18th annual meeting in London June 27 to July 1, 1966, IWC decided the recommended pelagic catch limit for the 1966/67 Antarctic season should be reduced from 4,500 to 3,500 blue–whale units. It also confirmed the decision taken at the 17th annual meeting in 1965 that the total catch for the 1967/68 season should be less than the "combined sustainable yields of the fin and sei whale stocks as determined on the basis of more precise scientific evidence."

To further preserve the world's blue whales, IWC member

countries with land stations in the Southern Hemisphere agreed that killing blue whales should be prohibited in the Southern Hemisphere instead of the present ban only in waters south of lat. 40° S. The cooperation of non–member countries was requested.

The 5–year ban on killing blue whales in the North Pacific was reaffirmed, and the humpback whale prohibition was extended through 1967. It was agreed that there was no need at present to recommend further regulations on killing sei or sperm whales in the North Pacific. It was agreed also that the North Pacific catch of fin whales should be brought below the estimated sustainable yield by 1969, but the Commission took no action on this proposal because the North Pacific member nations could not agree upon a method of reaching this objective.

North Pacific Fur Seal Commission

At its ninth annual meeting in Ottawa, Canada, February 21 to 24, 1966, the North Pacific Fur Seal Commission reviewed the 1965 fur seal research and management activities on the Commander, Robben, and Pribilof Islands. The Commission noted that the seal herds of the Commander and Robben Islands continued to increase but that unfavorable weather and oceanographic conditions in the spring of 1965 caused an unusually high mortality among fur seal pups on Robben Island. The Commission also reviewed and approved plans of the Party Governments (Canada, Japan, United States, and U.S.S.R.) for fur seal investigations in 1966 on land and at sea.

The sealskin quality study, begun by the Commission in 1965, was continued in 1966. The four Party Governments made available 400 sealskins to be processed, graded, and evaluated by a single fur seal processing firm. This study will provide data on how factors, such as age, sex, and time and method of capture, affect the quality of fur sealskins. The Governments of Canada and Japan each provided 100 sealskins taken at sea, and the Governments of the U.S.S.R. and the United States provided like numbers of sealskins taken on land.

The results of the study will be reviewed by the Commission during its tenth annual meeting to be held in Washington, D.C., beginning February 13, 1967.

UN/FAO Caribbean Fisheries Development Project Liaison Officers Meeting

UN/FAO Caribbean Fisheries Development Project Liaison

Officers held their first meeting April 26 to 28, 1966, in Bridgetown, Barbados, with representatives of FAO, the United Nations Special Fund, and the Subcontractor (Bureau of Commercial Fisheries). Representatives of the participating Governments (Antigua, Barbados, British Guyana, British Honduras, Dominica Island, Dominican Republic, Grenada, Haiti, Jamaica, Monserrat, Puerto Rico, St. Kitts–Nevis–Anquilla, St. Lucia, Trinidad–Tobago, and Virgin Islands) reviewed the work plan for the Exploratory Fishing, Marketing, and Training parts of the Project and some administrative matters and held a 1–day fishery workshop.

Cooperation and Coordination with International, Federal, State, and Other Agencies

Through cooperation with various foreign governments, other Federal agencies, States, universities, and private organizations, the Bureau profits from the skills and facilities of these groups and promotes the exchange of ideas and results. The Bureau also coordinates many of its programs with these groups.

Cooperation with International Groups

Cooperation enables international groups to solve mutual problems by developing and exchanging needed information. International organizations, such as Food and Agriculture Organization of the United Nations, Great Lakes Fishery Commission, International Commission for the Northwest Atlantic Fisheries, and the International North Pacific Fisheries Commission, coordinate the research efforts of several countries.

Information follows on two relatively new cooperative efforts, with Codex Alimentarius Commission and the U.N. Special Fund Project for the Gulf and Caribbean.

Cooperation with Codex Alimentarius Commission.—The Bureau actively participates in the work of Codex Alimentarius Commission, an international body operating under auspices of the United Nations. The Commission is responsible for developing and establishing international standards for foods. These standards will provide worldwide uniform criteria for food products.

The principal areas of work in which the Bureau participates include development of standards for fish and fishery products, basic requirements for fish plant sanitation, and provisions for labeling fishery products. The Bureau's active participation in this Commission will help establish standards that will reflect

acceptable manufacturing and marketing practices for fishery products.

Cooperation with United Nations.—The Bureau's Tropical Atlantic Biological Laboratory at Miami, Fla., participated in the United Nations Special Fund Project for the Gulf and Caribbean. The Laboratory provided training on the research vessels *Geronimo* and *Undaunted* for 12 fishery scientists and fishery officials from countries bordering the Gulf of Mexico and the Caribbean—mostly from the British and Dutch West Indies. Brazilian scientists and observers also participated in one cruise of the *Geronimo* between Trinidad and Rio de Janeiro.

Foreign Currency Research Program (P.L. 480).—As provided in Section 104(k) of Public Law 480, the Bureau has contracted with 11 fishery research institutions in India and Israel. This Section provides that grants or contracts can be made with foreign institutions to perform research of interest to Federal agencies.

Fishery scientists in Israel and India made some noteworthy achievements. At the Dor, Israel, research station one of the Bureau's research contractors made a discovery that will contribute to the culture of mullet. He induced grey mullet to spawn in captivity, and mullet larvae now fill the aquariums.

Research on fish genetics by the Hebrew University continues to produce interesting results. A new crossbreed of carp was found to grow faster and produce a larger percentage of exceptionally large fish than the parent stocks or other strains.

The Sea Fisheries Research Station in Haifa, Israel, is studying populations of tuna. The studies should reveal some interesting comparisons of the population dynamics of the tuna resources of the Mediterranean and eastern Pacific. This Station is also accumulating valuable data on changes in fertility of Israeli coastal waters as a result of the impoundment of the Nile River by the Aswan Dam.

In India the studies are continuing on the little–known, abundant herringlike fishes of the Indian Ocean. Excellent fish collections from southern India provide material for preparing an identification guide for these fishes.

Cooperation with Federal Agencies

The Bureau has formal and informal agreements with other Government agencies—Atomic Energy Commission; Department of Agriculture; Department of Commerce (including the Bureau of Census and the Weather Bureau); Department of Health, Education, and Welfare; Department of Labor; Department of State;

Department of the Treasury; Economic Development Administration; Federal Trade Commission; and Department of Defense.

Bureau cooperation with Federal agencies includes analysis of data collected during two cruises in 1965 off the Columbia River; trawling for smelt and chubs in Lake Superior with converted fishing vessels; determining whether surplus stocks of Tennessee reservoir fish can be produced at low cost in sufficient quantities for fish meal production; EDA funds for financing commercial fishery projects to alleviate economic conditions in certain areas; designation of October as Cooperative Month; and training programs in fisheries–related subjects for participants from certain foreign countries.

Cooperation with AEC (Atomic Energy Commission).—Major emphasis under the AEC–Bureau contract agreement for Columbia River studies centered on analysis of data collected during two cruises in 1965 of the Bureau vessel *John N. Cobb* and one cruise June 6 to 21, 1966, of the chartered vessel *Commando.* The main activity of the *Commando* was 48 drags with an otter trawl off the Columbia River in water depths of 300 to 6,300 feet. Species collected in medium depths (1,608 to 2,364 feet) included sablefish, Dover sole, rockfish, and tanner crabs. Noncommercial species—rattails, longfinned cod, and channel rockfish —dominated deep–water catches. The only exception was one drag at a depth of 3,000 feet that caught 300 pounds of sablefish.

Cooperation with EDA (Economic Development Administration).—The EDA–Bureau 18–month program, begun in January 1966, has proved that Lake Superior trawlers can catch chubs and smelt throughout the year in contrast to the much shorter traditional fishing period. The program provided for converting two fishing vessels for trawling in Lake Superior. The first vessel was fishing by mid–June 1966. Average catch rates by the vessel were encouraging and indicate that at least a limited trawl fishery is economically feasible. The second vessel has been converted and will begin fishing in January 1967.

A second EDA–Bureau study was begun in 1966 in Tennessee to determine whether surplus stocks of reservoir fish, such as gizzard shad, carp, and sheepshead, could be produced at low cost in sufficient quantities for fish meal production. A specially built vessel equipped with modern deck gear capable of handling trawls, purse seines, and lampara seines was acquired. Trawl catches of gizzard shad as high as 1,500 pounds in a 5–minute drag have been made.

The EDA Liaison Office of the Bureau continued to work

closely with officials of EDA in the U.S. Department of Commerce and Bureau Regional Offices in planning and evaluating, reviewing, and recommending applications for EDA funds to finance commercial fishery projects to alleviate depressed economic conditions in certain areas.

EDA during 1966 approved technical assistance grants of more than $670,000 to finance projects involving the commercial fishery and also released nearly $700,000 for an industrial loan which was approved in 1962 by the Area Redevelopment Administration, EDA's predecessor. These EDA–financed projects are in economically depressed areas in each of the Bureau Regions, with the exception of California.

Technical assistance projects include a study to determine the economic feasibility of establishing a commercial Pacific hake fishery at Grays Harbor, Wash.; a survey of the expansion potential of the seafood industry in Carteret County, N.C.; research relating to processing of Louisiana crawfish; a pilot study of a marine fishery extension service at Gloucester, Mass.; research in artificial propagation of seed oysters, Lancaster, Va.; a study of the feasibility of developing a fish meal industry that will use the rough fish population of the Tennessee Valley reservoirs; an evaluation of an experimental fish reduction process applicable to small fishing industries; development and testing of fishing and processing techniques designed and developed to aid the commercial fishing sector of the Lake Superior economy; and a study of the feasibility of constructing a multipurpose processing plant at Seward, Alaska.

In addition to improving economic conditions in depressed areas, the successful application of the results of these studies could benefit fishing industries of other areas. For example, EDA permitted advance publication of an article describing use of the pasture harrow for cultivating oysters to give all oyster growers in the United States early access to information developed from a technical assistance grant for oyster research in Pacific County, Wash.

Cooperative Observance Program.—The Secretary of Agriculture designated October as Cooperative Month for the annual Cooperative Observance Program. More than half of the States participated, making this the greatest response since the start of the practice of making such an observance. Federal agencies sponsored 11 seminars. The Department of Interior's seminar on October 7 gave information on fishery cooperatives. About 200 people attended the Interior seminar.

Training program assistance to AID (Agency for International Development).—During 1966 the Bureau arranged training programs in fisheries–related subjects for 28 participants from 8 countries (Brazil 12; Ghana 2; Kenya 1; Korea 7; Nigeria 2; Tanzania 2; Thailand 1; and Uganda 1). AID recommended the participants and financed them. At least 17 of the participants hold policy–making positions that would indirectly or directly affect the fisheries of the United States.

Cooperation with States

The Bureau cooperates with two interstate commissions—Atlantic States Marine Fisheries Commission and the Gulf States Marine Fisheries Commission. These Commissions coordinate the research efforts and conservation actions of the States involved in such compacts. This coordinated action, effected through formal agreements, is based chiefly on data provided by Bureau scientists.

All coastal and inland States having commercial fisheries also have cooperative arrangements with the Bureau for collecting and compiling fishery statistics.

Cooperation with Other Groups

The Bureau cooperates closely with numerous national, regional, and local fishery and allied trade associations. Its Ichthyological Field Station at Stanford, Calif., provided direction in 1966 for the International Shark Tagging Program of the American Institute of Biological Sciences. The Program was designed to extend basic knowledge of the biology of sharks through volunteer tagging by marine workers throughout the world.

This cooperation draws upon nearly all development, research, and service functions of the Bureau. The Bureau uses also the professional skill and research facilities of universities, State agencies, trade associations, and private organizations by contracting with such groups to supplement Government research and service activities. Appendix E lists the organizations with which the Bureau had research and development contracts and grants in 1966.

Organization, Employment, Budget, and Physical Properties

A summary of the Bureau's organization, employment, budget, and physical properties in 1966 follows:

Organization

In February 1966, several changes occurred in the Bureau in Washington, D.C. The Office of International Relations was transferred from the Office of the Commissioner of Fish and Wildlife to the Bureau of Commercial Fisheries and redesignated as a Division. Also, the Branch of Foreign Fisheries was transferred from the Division of Industrial Research to the new Division of International Relations, and additional Branches of International Agreements, Special Studies, and Technical Assistance were established in the Division. Personnel from the Commissioner's Office of Information were assigned to function as separate Information Officers for each Bureau of the Fish and Wildlife Service.

In the field, the biological field station at St. Petersburg, Fla., was redesignated as a Laboratory. The Biological Laboratory at Washington, D.C., was transferred to Miami and identified as the Tropical Atlantic Biological Laboratory.

A chart of the Bureau's organization as of December 31, 1966, is shown in figure 1, and a map of the six regional and one area offices as of December 31, 1966, and the territory under each is shown in the frontispiece.

Employment

Employment for the Bureau averaged 2,319 throughout calendar year 1966 (1,945 permanent and 374 seasonal employees). The peak employment in 1966 was reported at the end of July when the staff comprised 1,935 permanent and 708 seasonal employees—a total of 2,643. The variations in the number of employees throughout 1966 and the relation between the total number and the number of permanent employees and seasonal, or temporary, employees are shown in figure 2.

Bureau employees fall generally into four broad categories. Of the total 2,126 full-time employees reported as of October 31, 1966, 954 were classified in about 43 professional and technical series; 273 in 11 subprofessional series, 516 in 36 clerical and administrative series; and 383 were in positions, the pay of which is determined outside the Classification Act (192 vessel positions, 191 other). Figure 3 shows the grade structures for the professional and technical series, subprofessional series, and the clerical and administrative series and the number of employees in each grade for these three classifications as of October 31, 1966.

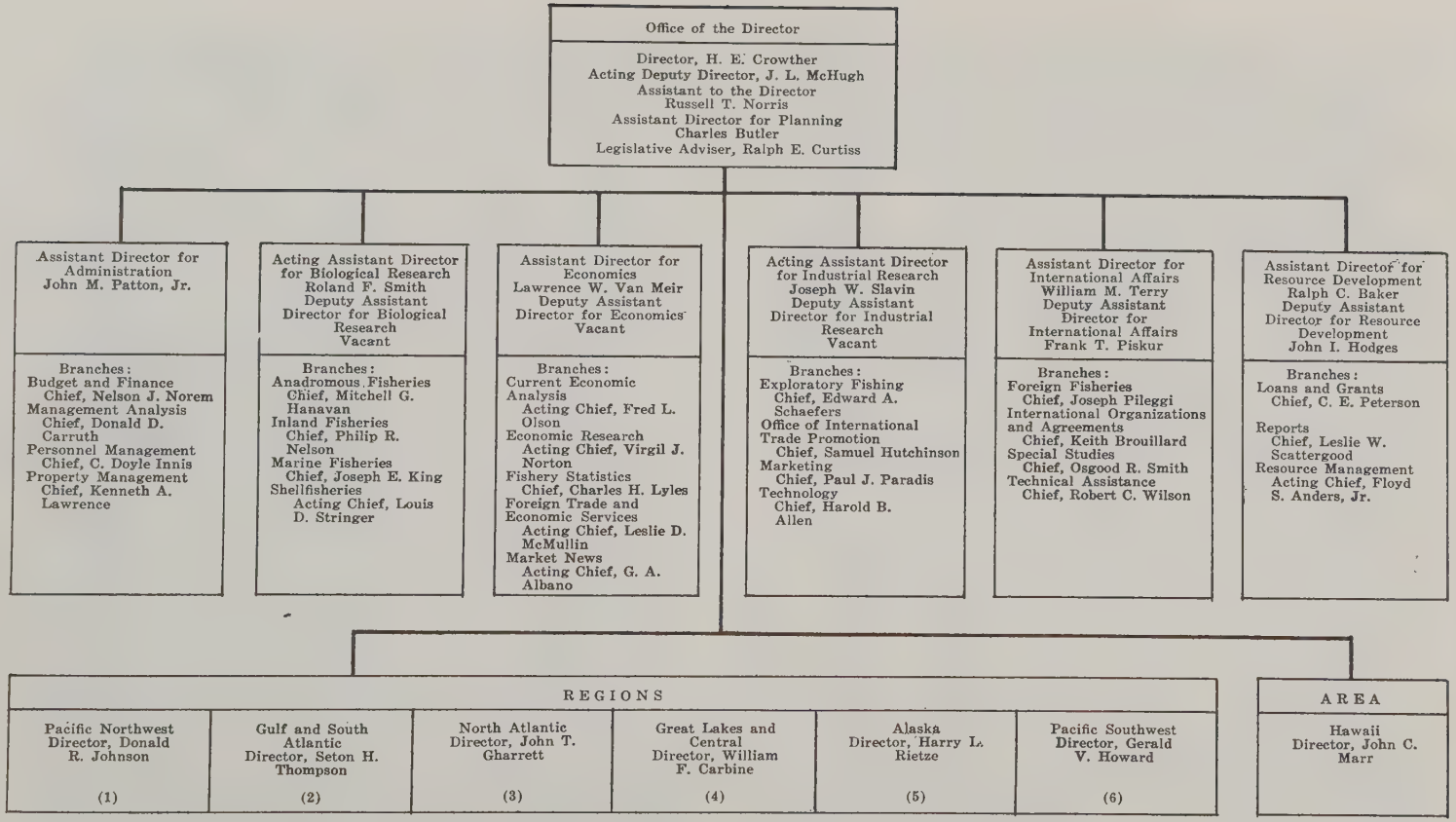


FIGURE 1.—Organization Chart, Bureau of Commercial Fisheries, December 31, 1966.

Budget

For fiscal year 1966, $47,996,000 were available to carry out the Bureau's programs (app. F). Of this amount, $39,400,000 were from annual appropriations; $5,400,000 from Public Law 466 (known as the Saltonstall–Kennedy Act) funds; $792,000 made available to the Bureau by the Great Lakes Fishery Commission; and $675,000 from members of the fishing industry for inspection and grading of fishery products. The Bureau also expected $1,507,000 in reimbursable funds from other Federal agencies and $92,000 non–Federal reimbursable funds.

Figure 4 shows the available funds to carry out the Bureau's program for each year from 1957 to 1966.

Physical Properties

The principal properties of the Bureau are field laboratories and stations, vessels, and installations on the Pribilof Islands (app. G). In fiscal year 1966, replacement and improvement of Bureau facilities continued. In that year the Bureau had 23 large laboratories and installations, 73 smaller stations and offices, and 29 vessels of 40 feet and longer. Figures 5, 6, and 7 show the Bureau's principal fishery biological research laboratories, and figure 8 shows the principal exploratory fishing and gear research and technological laboratories.

The Shellfish Research Center at Milford, Conn., the only Bureau laboratory being built in 1966, was completed in 1966. This Center will be used for basic research on physiology and ecology of commercial shellfish and methods for artificial culture of shellfish.

Only two Bureau vessels were under construction in 1966. The *Delaware II,* which was being built at South Portland, Maine, burned in 1965. The contract has been reconstituted, and the vessel is being built. It is scheduled to be completed in November 1967. The Bureau's Exploratory Fishing and Gear Research Base at Gloucester, Mass., will use the *Delaware II* in the North Atlantic.

The other vessel, the *Oregon II,* which will replace the *Oregon,* is being built at Pascagoula, Miss., and is expected to be delivered to the Bureau in May 1967. The Bureau's Exploratory Fishing and Gear Research Base at Pascagoula will use the *Oregon II.*

The Bureau's principal fishery research vessels are shown in figures 9 and 10.

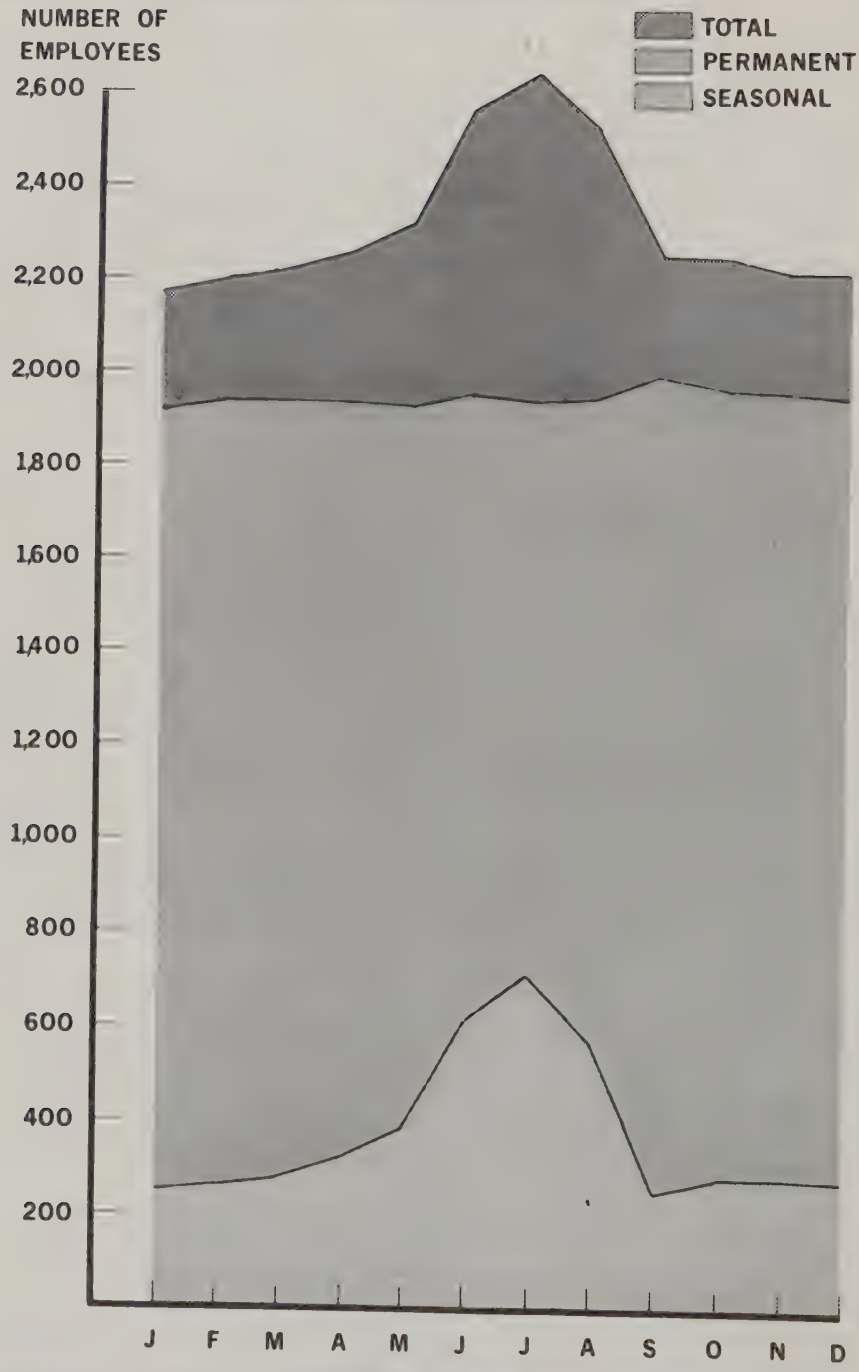


FIGURE 2.—Bureau of Commercial Fisheries employment totals by month, calendar year 1966.

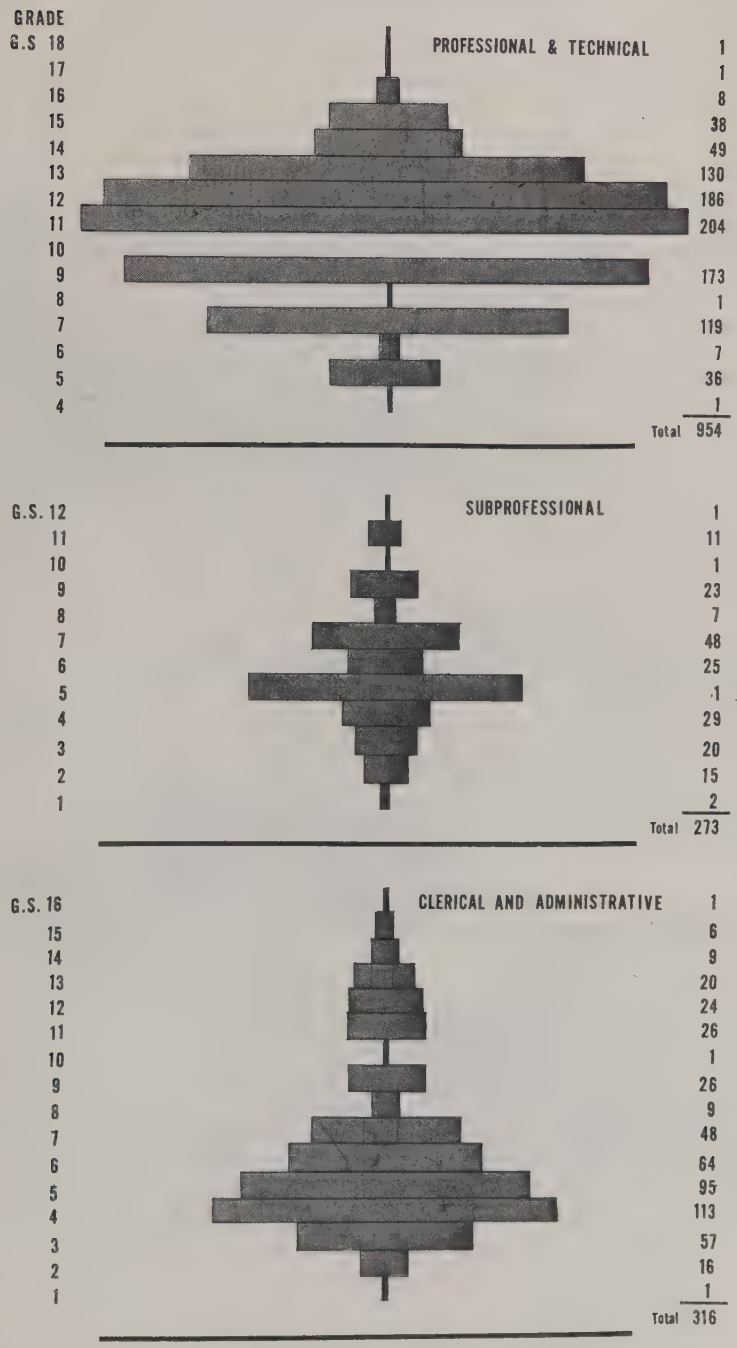


FIGURE 3.—Distribution by grade of professional and technical, subprofessional, and clerical and administrative employees, Bureau of Commercial Fisheries, October 31, 1966.

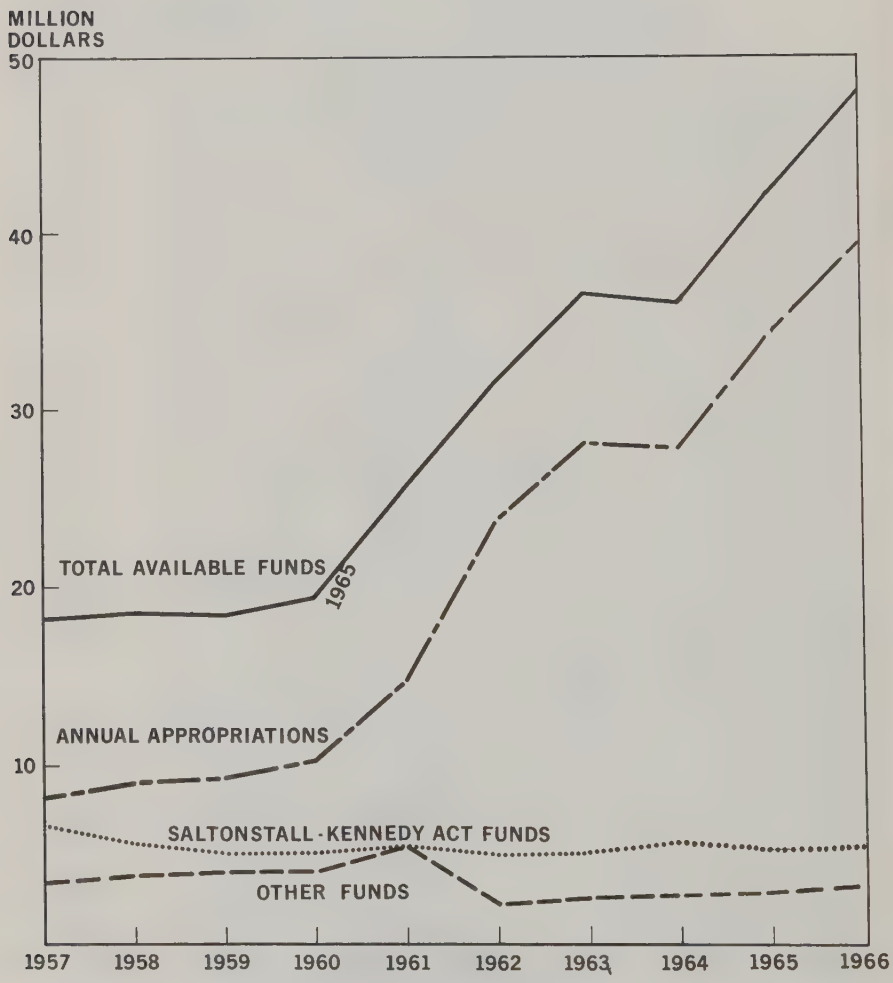


FIGURE 4.—Funds available to the Bureau of Commercial Fisheries, fiscal years 1957–66.

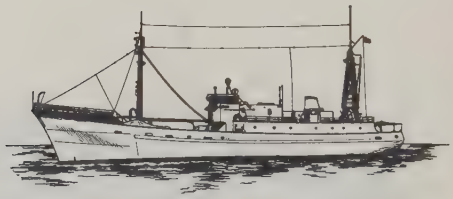
FIGURE 5.—Bureau of Commercial Fisheries biological laboratories, Pacific, 1966.

FIGURE 6.—Bureau of Commercial Fisheries biological laboratories, Middle and South Atlantic and Gulf Coast, 1966.

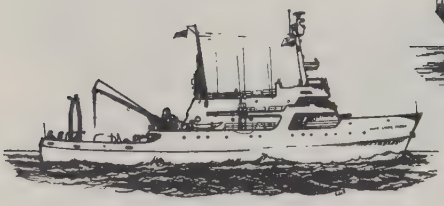
FIGURE 7.—Bureau of Commercial Fisheries biological laboratories, North Atlantic and Great Lakes, 1966.

FIGURE 8.—Bureau of Commercial Fisheries exploratory fishing and gear research and technological laboratories, 1966.

FIGURE 9.—Bureau of Commercial Fisheries principal research vessels operating in the Atlantic in 1966.

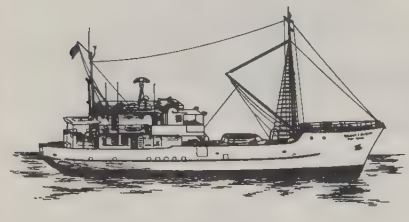


Townsend Cromwell

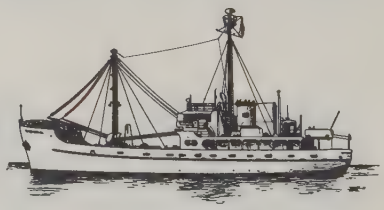


David Starr Jordan

Black Douglas



Charles H. Gilbert



Geo. B. Kelez

John N. Cobb

FIGURE 10.—Bureau of Commercial Fisheries principal research vessels operating in the Pacific in 1966.

Publications

Publications are the principal means for the Bureau to tell the U.S. fishing industry, fishery scientists, and the general public of its progress in its biological, chemical, economic, engineering, exploratory, marketing, and statistical efforts to improve and expand the U.S. fishing industry.

The Bureau's publications fall into three general categories. Forty-seven percent of the publications concern statistics and, therefore, interest the fishing industry and fishery researchers; 37 percent are contributions to scientific knowledge, particularly relating to fishery biology, fishery technology, and oceanography; and the remaining 16 percent present popular information for the general public and nontechnical or semitechnical reports for the fishing industry.

Exclusive of the 1,770 Fishery Products Reports (5,558 p.), which the seven Market News Service field offices issued five times a week, the Bureau sponsored 845 publications (11,086 p.) in 1966. In the Fish and Wildlife Service series 513 reports (7,626 p.) were published. The remaining 332 publications (3,460 p.) appear in non–Service technical and trade journals. Bureau employees wrote most of the publications; employees of research institutions under contract to the Bureau and unpaid collaborators wrote the others.

Appendix H of this report describes the Bureau's series of publications and partially lists the publications issued in 1966.

Appendix A—Fisheries of the United States

A–1.—*Employment, fishing craft, and establishments, calendar years 1966 and 1965*

	1966	1965
Persons employed:	*Number*	*Number*
Fishermen	(1)	128,565
In fishery wholesaling and manufacturing establishments	(1)	86,865
Total	(1)	215,430
Craft used:		
Fishing:		
Vessels (5-net tons and over)	(1)	12,311
Motor boats	(1)	63,828
Other boats	(1)	3,393
Total	(1)	79,532
Fishing vessels, documentations issued and canceled:		
First documentation	816	612
Redocumentation	30	51
Documents canceled	(1)	−422
Net gain	(1)	241
Fishery shore establishments:		
Pacific Coast States	(1)	557
Atlantic Coast and Gulf States	(1)	2,931
Great Lakes and Mississippi River States	(1)	677
Hawaii	(1)	24
Total	(1)	4,189

[1] Not available.

A–2.—*U.S. catch of certain species, calendar years 1966 and 1965 and record catch*

Species	1966 [1]		1965		Record catch	
	Million pounds	*Million dollars*	*Million pounds*	*Million dollars*	*Year*	*Million pounds*
Menhaden	1,310	22	1,726	27	1962	2,348
Salmon	405	67	327	65	1936	791
Crabs, blue, king & Dungeness	362	34	332	30	1966	362
Tuna [2]	267	45	319	42	1950	391
Shrimp	235	96	244	82	1954	268
Haddock	134	14	134	14	1929	294
Flounders, Atlantic & Gulf	127	16	134	15	1965	134
Whiting	90	4	83	2	1957	133
Ocean perch, Atlantic	81	4	84	3	1951	258
Clam, Atlantic, surf, hard and soft (meats)	72	18	70	17	1966	72
Herring, sea, Atlantic	68	1	76	1	1902	201
Alewives, Atlantic	54	1	65	1	1908	90
Oysters (meats)	50	26	55	28	[3] 1908	152
Jack mackerel	41	1	67	2	1952	147
Halibut, Pacific	40	10	40	9	1915	67
Mullet	37	2	41	3	1902	43
Cod, Atlantic	36	3	36	3	1880	294
Lobster, northern	30	23	30	22	1960	31
Scup or porgy	27	3	36	3	1960	49
Scallops, sea (edible meats)	17	8	20	13	1961	27
Herring, sea, Pacific	14	(4)	35	1	1937	263
Snapper, red	13	4	14	4	1902	23
Pollock	10	1	12	1	1938	41
Striped bass, Atlantic	8	2	8	1	1961	9
Mackerel, Pacific	3	(4)	7	(4)	1935	147
Sardines, Pacific	1	(4)	2	(4)	1936	1,502
Other	809	49	780	57		
Total	4,341	454	4,777	446		

[1] Preliminary.
[2] Does not include landings of tuna by U.S. vessels in Puerto Rico.
[3] First year in which an oyster survey was conducted.
[4] Less than $500,000.

A–3.—*Summary of processed fishery products, by quantity and value, calendar years, 1966 and 1965*

Item	1966 [1]		1965	
	Quantity	Value	Quantity	Value
Packaged products, fresh and frozen:				
Fish:				
Not breaded:				
Fillets and steaks, raw:	*Thousand pounds*	*Thousand dollars*	*Thousand pounds*	*Thousand dollars*
Flounders	49,723	22,837	49,586	20,267
Groundfish, including ocean perch	74,945	27,278	77,180	27,037
Halibut	7,503	4,726	8,874	5,224
Other (including whale meat for animal feeding)	90,096	25,505	75,007	19,709
Total	222,267	80,346	210,647	72,237
Breaded, raw and cooked:				
Sticks	81,295	35,767	82,483	35,778
Fillets, portions and steaks	159,000	65,000	150,671	60,958
Shellfish:				
Not breaded:				
Shrimp	103,000	95,790	101,783	94,471
Other	165,131	125,500	142,201	107,746
Total	268,131	221,290	243,984	202,217
Breaded:				
Shrimp	104,040	93,607	98,144	77,091
Other	21,023	18,500	12,961	11,343
Total	125,063	112,107	111,105	88,434
Specialties, fish and shellfish	50,333	36,232	35,502	26,107
Total fresh and frozen	906,089	550,742	834,392	485,731
Canned:				
Fish and shellfish for human consumption:				
Tuna	394,268	270,239	358,405	232,976
Salmon	208,514	134,578	174,413	122,744
Sardines:				
Maine (sea herring)	31,187	12,219	29,646	10,868
Pacific	116	25	374	71
Mackerel	18,575	3,346	31,655	4,997
Clam products and specialties	72,098	21,851	70,810	19,263
Shrimp and specialties	15,882	23,281	16,241	20,923
Oyster and specialties	16,380	7,220	11,470	6,128
Squid	11,363	1,148	12,420	1,116
Other	50,334	29,676	44,084	27,747
Total for human consumption	818,717	503,583	749,518	446,833
Bait and animal food:				
Animal food	357,337	46,554	371,355	46,848
Salmon eggs for bait	559	1,254	756	1,550
Total bait and animal food	357,896	47,808	372,111	48,398
Total canned	1,176,613	551,391	1,121,629	495,231
Cured fish and shellfish:				
Salted	39,500	16,985	40,425	17,213
Smoked	31,000	32,965	31,573	33,896
Dried fish and shellfish, and lutefisk	[2] 3,000	3,750	[2] 2,450	3,057
Total cured	73,500	53,700	74,448	54,166
Industrial products:				
Meal and scrap	448,868	32,404	508,102	35,707
Oil, body and liver	164,269	12,577	195,440	14,852
Fish solubles	169,218	5,170	189,680	5,939
Oyster shell lime and poultry grit	675,410	4,472	699,056	4,559
Marine pearl shell and mussel shell buttons	[3] 223	815	[3] 409	1,017
Other		17,931		20,756
Total industrial products		73,369		82,830
Grand total		1,229,202		1,117,958

[1] Preliminary. [2] Includes freeze-dried products. [3] Number of gross.

A-4.—*Foreign trade in fishery products, by quantity and value, calendar years 1966 and 1965*

Item	1966		1965	
	Quantity	Value	Quantity	Value
Imports:				
Edible:	*Thousand pounds*	*Thousand dollars*	*Thousand pounds*	*Thousand dollars*
Fresh or frozen:				
Fresh-water (not fillets)	31,346	12,061	35,436	12,968
Salt-water (not fillets)	620,310	107,293	521,368	72,925
Groundfish and ocean perch fillets	315,097	82,593	294,954	73,934
Other fillets	92,708	36,677	74,724	30,078
Shrimp	176,425	141,239	160,287	111,277
Lobsters:				
Common	17,047	15,521	18,597	17,421
Spiny	36,923	61,054	37,814	61,280
Scallops	16,712	8,375	16,283	10,474
Other shellfish	7,677	3,618	9,808	3,416
Canned:				
Anchovies	5,723	3,971	5,593	3,900
Bonito and yellowtail	2,854	794	3,932	1,043
Salmon	589	345	101	80
Sardines	57,588	17,030	45,070	13,875
Tuna	61,560	27,598	50,961	20,428
Crabmeat	2,257	2,819	4,166	4,935
Lobsters	3,018	7,064	2,980	7,336
Oysters and oyster juice	12,015	4,494	8,638	3,225
Other	48,966	16,492	30,236	14,184
Cured:				
Dried, pickled, or salted:				
Cod, haddock, hake, pollock, and cusk	42,411	11,225	42,471	10,141
Herring	31,493	4,690	26,742	3,756
Other	3,220	1,229	2,290	950
Smoked or kippered	4,010	1,112	3,599	955
Other	6,057	3,280	2,366	796
Total edible	1,596,006	570,574	1,398,416	479,377
Nonedible:				
Fish and marine animal oils	[1] 9,688	6,299	[1] 11,323	6,945
Fish meal and scrap	[2] 461	59,912	[2] 271	30,720
Fish solubles	5	319	5	263
Other		85,701		83,564
Total nonedible		152,231		121,492
Grand total imports		722,805		600,869
Exports of domestic products:				
Edible:				
Fresh or frozen	52,265	25,872	39,700	18,593
Canned:				
Mackerel	1,139	206	2,174	401
Salmon	20,484	14,561	24,892	15,916
Sardines	3,557	1,168	3,376	990
Shrimp	4,479	5,192	4,510	4,809
Squid	10,159	1,067	11,911	1,160
Other	15,374	12,671	7,302	5,212
Total canned	55,192	34,865	54,165	28,488
Cured	2,147	2,145	2,579	2,227
Total edible	109,604	62,882	96,444	49,308
Nonedible:				
Fish and marine animal oils	77,255	[1] 7,401	103,807	9,208
Other		14,530		10,967
Total nonedible		21,931		20,175
Grand total exports		84,813		69,483

[1] In thousand gallons.
[2] In thousand tons.

Appendix B—New Legislation

Control or Elimination of Jellyfish (Sea Nettles) and Other Such Pests in the Coastal Waters of the United States

16 U.S.C. 1201–1205

To conserve and protect the fish and shellfish resources in the coastal waters of the United States and to promote and safeguard water-based recreation, the Secretary of the Interior is authorized to cooperate with and provide assistance to the States and the Commonwealth of Puerto Rico in controlling and eliminating jellyfish and other such pests and in conducting research to control floating seaweed in such waters. The cost of such work shall be borne equally by the Federal Government and by the States and the Commonwealth of Puerto Rico, acting jointly or severally.

The Act consents to any compact between any two or more States for the purpose of carrying out the work authorized. There is authorized to be appropriated not to exceed $500,000 for fiscal year 1968; $750,000 for fiscal year 1969; and $1,000,000 for fiscal year 1970.

80 Stat. 1149; Public Law 89–720; Act of November 2, 1966.

Fish Protein Concentrate Research and Authorization for Demonstration Plants

16 U.S.C. 778d–778h

Authorizes the Secretary of the Interior to conduct, and through grants to and contracts with public and private agencies to promote research to develop economical processes for production of fish protein concentrate from unutilized and underutilized species of fish. The Secretary may construct one experiment and demonstration plant for the production of fish protein concentrate and may acquire by lease one additional plant for such purpose. Construction or lease cannot be accomplished until the Secretary of Health, Education, and Welfare has certified that fish protein concentrate produced from whole fish complies with the provisions of the Federal Food, Drug, and Cosmetics Act.

The authority granted by this Act expires November 2, 1971. There is authorized to be appropriated $1,000,000 for construction of one plant and $1,555,000 annually for a period of 5 fiscal years beginning with fiscal year 1968, for leasing one additional demonstration plant, for the operation of the constructed plant and the leased plant, and for conducting the programs authorized by the Act.

80 Stat. 1089; Public Law 89–701; Act of November 2, 1966.

Fur Seal Act of 1966

16 U.S.C. 1151–1187; 5 U.S.C. 2254g

This Act supersedes the Fur Seal Act of 1944 and further implements the Interim Convention on the Conservation of North Pacific Fur Seals signed at Washington, on February 9, 1957, as amended by the protocol signed at Washington on October 8, 1963, by the United States, Canada, Japan, and the Union of Soviet Socialist Republics. By the terms of the Act, the Secretary of the Interior is authorized to conserve and manage the North Pacific fur seals and to administer the special reservation of the Pribilof Islands.

The Act further authorizes the Secretary to set aside land on St. Paul Island for a townsite and to convey title to both improved and unimproved lots to individual natives of the Pribilof Islands after the townsite has been surveyed and after the Secretary is satisfied that the St. Paul community is capable of becoming a viable, self-governing community. Proceeds of such sales are to be made available to the governing body of St. Paul for municipal purposes. Provision is also made for 5 yearly grants to the community in the amounts of $50,000, $40,000, $30,000, $20,000, and $10,000.

The Act also provides for the protection of sea otters on the high seas.

80 Stat. 1091; Public Law 89–702; Act of November 2, 1966.

Marine Resources and Engineering Development Act of 1966

33 U.S.C. 1101–1108

Provides a declaration of policy for a coordinated, comprehensive, and long–range national program in oceanographic and scientific endeavors, engineering and technology with relation to the oceans, the Continental Shelf, the Great Lakes, and the seabed and subsoil of the submarine areas adjacent to the coasts of the United States. The Act establishes the National Council on Marine Resources and Engineering Development on the Secretarial level with the Vice President as Chairman. It also establishes a Commission of 15 members appointed by the President from Federal and State Governments, industry, universities, laboratories, and other institutions engaged in marine, scientific or technological work. Four advisory members are appointed from the Congress.

The Commission shall make a comprehensive investigation of all aspects of marine science and recommend a plan for an ade-

quate national oceanographic program that will meet present and future needs. The report is to be made to the President and the Congress via the Council within 18 months and the Commission will terminate 30 days thereafter. The provisions of the Act with respect to the Council expire 120 days after submission of the Commission report. In conformity with the declared policy, the President, with the advice and assistance of the Council, will survey marine science activities and develop a comprehensive program. He will designate and fix responsibility for such program among the agencies of Government, ensure cooperation among them and review their activities.

Under policy guidance of the President, the Council shall coordinate a program of international cooperation in marine science activities pursuant to agreements made by the President with the advice and consent of the Senate. Reports are to be made in January of each year to the Congress. There is authorized to be appropriated such sums as may be necessary to carry out the Act but not more than $1.5 million may be appropriated in any 1 fiscal year.

80 Stat. 203; Public Law 89–454; Act of June 17, 1966.

National Sea Grant College and Program Act of 1966

33 U.S.C. 1121–1124

Amends the Marine Resources and Engineering Development Act of 1966 (33 U.S.C. 1101–1108) by adding a title authorizing contracts with and grants to suitable public or private institutions of higher education, institutes, laboratories, and public or private agencies which are engaged in or concerned with the various fields related to the development of marine resources. The program authorized is to be administered by the National Science Foundation which will initiate and support programs at sea grant colleges and other institutions to educate participants in the various fields involved in development of marine resources; initiate and support research programs related to the development of marine resources, with preference for research aimed at practices, techniques, and design of equipment applicable to development of marine resources; and encourage and develop programs of instruction, practical demonstration, and publication by sea grant colleges and other institutions to impart useful information to persons employed or interested in the fields related to the development of marine resources, the scientific community, and the general public.

For the purposes of this Act there is authorized to be appropriated to the National Science Foundation for fiscal year 1967, not to exceed $5 million; for fiscal year 1968, not to exceed $15 million, and for each subsequent fiscal year only such sums as the Congress may specifically authorize.

80 Stat. 998; Public Law 89–688; Act of October 15, 1966.

12–Mile Fishery Jurisdiction

16 U.S.C. 1091–1094

Establishes a fisheries zone of 9 miles contiguous to the 3–mile territorial sea of the United States in which the United States will exercise the same exclusive rights in respect to fisheries as it has in its territorial sea, subject to the continuation of traditional fishing by foreign states within this 9-mile zone as may be recognized by the United States. The Act is not to be construed as extending the jurisdiction of the States to the natural resources beneath and in the waters of the 9–mile fisheries zone or as diminishing their jurisdiction to such resources beneath and in the waters of the 3–mile territorial seas of the United States. (Enforcement of this Act is provided for within the terms of Public Law 88–308; 16 U.S.C. 1081–1085.)

80 Stat. 908; Public Law 89–658; Act of October 14, 1966.

Appendix C—Fisheries Loan Fund

C–1.—*Status of fisheries loan fund, June 30, 1966*

Funds appropriated		$13,000,000
Principal collected	$11,400,000	
Interest collected and accrued	2,280,000	
Total collected		13,680,000
Total		26,680,000
All expenses to end of fiscal year 1966	2,229,000	
Net loans approved	18,416,669	
Total		20,645,669
Balance		6,034,331

C–2.—*Cumulative totals, fiscal years 1965 and 1966, and totals, fiscal year 1966*

	Cumulative total				Total fiscal year 1966	
	As of June 30, 1965		As of June 30, 1966			
	Number	*Amount*	*Number*	*Amount*	*Number*	*Amount*
Applications received	1,644	$42,734,194	1,830	$46,458,719	186	$3,724,525
Applications approved	865	19,206,671	957	21,119,566	92	1,912,895
Applications declined	422	9,777,009	452	10,278,141	30	501,132
Applications ineligible	124	3,107,068	129	3,136,272	5	29,204
Being processed	28	758,222	32	697,608		

C–3.—*Cumulative totals, fiscal years 1965 and 1966, and totals, fiscal year 1966*

	Cumulative total				Total fiscal year 1966	
	As of June 30, 1965		As of June 30, 1966			
Northeast:	*Number*	*Amount*	*Number*	*Amount*	*Number*	*Amount*
Applications received	374	$11,091,860	392	$11,453,230	18	$361,370
Applications approved	195	4,948,289	205	5,197,559	10	249,270
California:						
Applications received	221	12,870,992	245	13,573,011	24	702,019
Applications approved	135	5,946,620	146	6,222,287	11	275,667
Gulf & South Atlantic:						
Applications received	349	8,565,378	371	8,973,204	22	407,826
Applications approved	130	2,950,284	135	3,050,516	5	100,232
Pacific Northwest:						
Applications received	310	5,769,641	361	6,918,683	51	1,149,042
Applications approved	182	3,168,302	215	3,872,213	33	703,911
Alaska:						
Applications received	324	3,591,264	390	4,635,189	66	1,043,925
Applications approved	194	1,877,388	227	2,461,203	33	583,815
Great Lakes:						
Applications received	42	451,989	47	512,332	5	60,343
Applications approved	13	108,920	13	108,920	0	0
Hawaii:						
Applications received	23	391,070	23	391,070	0	0
Applications approved	15	205,068	15	205,068	0	0
Puerto Rico:						
Applications received	1	2,000	1	2,000	0	0
Applications approved	1	1,800	1	1,800	0	0

C–4.—*Authorized use of loan proceeds, percentage by area*

[From beginning of program through fiscal year 1966]

	Debt payment	Improvements	Other
New England and Middle Atlantic	47	52	01
South Atlantic and Gulf	64	34	02
California	43	54	03
Pacific Northwest	32	67	01
Great Lakes	28	72	0
Alaska	16	83	01
Hawaii and Puerto Rico	46	50	04
Total	42	56	02

C–5.—*Number of loan applications received monthly, fiscal years 1957–66*

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
July		17	9	15	8	19	6	5	13	4
August		17	12	13	10	16	7	2	10	10
September		14	10	9	7	16	11	21	22	14
October		12	7	16	6	14	13	14	21	16
November		18	13	9	19	26	7	16	14	22
December	88	11	13	15	21	14	8	15	15	18
January	16	14	10	16	18	29	5	12	12	31
February	41	18	12	27	26	19	12	13	8	19
March	40	22	15	28	13	19	11	18	12	14
April	22	22	14	13	18	16	12	48	13	11
May	28	11	10	19	31	9	2	36	10	16
June	30	9	12	10	7	11	5	19	7	11
Total	265	185	137	190	184	208	99	219	157	186

C–6.—*Amounts applied for monthly, fiscal years 1957–66*

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
July		$274,524	$251,571	$830,182	$134,196	$532,305	$141,780	$136,794	$346,404	$34,900
August		931,110	363,000	234,465	275,972	297,614	223,021	11,718	213,015	223,249
September		607,851	385,517	465,610	176,781	438,773	117,243	233,864	544,554	150,752
October		204,635	62,532	305,150	195,095	145,443	132,107	243,298	199,273	177,585
November		375,583	153,559	124,905	428,011	296,877	144,267	296,669	256,687	341,360
December	$2,533,020	160,670	331,502	198,161	425,076	182,876	275,415	350,103	265,783	408,475
January	377,485	520,323	153,501	344,197	203,752	907,519	68,100	1,087,030	272,845	707,009
February	1,458,748	305,318	115,000	554,425	665,798	195,612	111,670	1,001,800	48,970	529,390
March	2,563,703	862,325	185,069	698,063	692,766	390,959	119,470	194,515	138,085	388,197
April	629,131	336,888	189,871	226,542	426,453	321,438	102,661	830,592	124,500	163,115
May	2,276,774	642,025	185,869	1,003,874	877,990	86,911	23,000	569,175	247,657	374,893
June	948,437	224,652	291,980	343,372	216,160	262,927	132,444	285,097	236,165	225,600
Total	10,787,298	5,445,904	2,668,971	5,328,946	4,718,050	4,059,254	1,591,178	5,240,655	2,893,938	3,724,525

Appendix D—American Fisheries Advisory Committee Membership, 1966

[Authorized by Act of July 1, 1954 (68 Stat. 376)]

Chairman: STANLEY A. CAIN, *Assistant Secretary of the Interior for Fish and Wildlife and Parks*

Harry Heber Bell
Harry H. Bell and Sons, Inc.,
2001 Pass-a-Grille Way,
St. Petersburg Beach, Fla. 33700

Lawrence I. Clarke
Atlantic Processing Company,
Drawer 248,
Amagansett, Long Island, N.Y. 11930

George J. Davidson
Boat Service Corp.,
Room #1, Administration Building,
Fish Pier,
Boston, Mass. 02100

Clifton D. Day, Manager
Sea Food Division,
California Packing Corp.,
215 Fremont Street,
San Francisco, Calif. 94119

J. Roy Duggan, President
King Shrimp Co., Inc.,
P. O. Box 899,
Brunswick, Ga. 31421

Ammon G. Dunton
Dunton, McLeod and Simmons,
White Stone, Va. 32578

Arthur H. Frohman
L. H. Frohman and Sons, Inc.,
510 North Dearborn Street,
Chicago, Ill. 60610

Ray H. Full, President
Kishman Fish Co.,
Vermilion, Ohio 44089

Jack Gorby
Food Division,
Westgate-California Corp.,
1995 Bay Front Street,
San Diego, Calif. 92101

E. Robert Kinney, President
The Gorton Corporation,
327 Main Street,
Gloucester, Mass. 01931

Thomas D. McGinnes, President
Virginia Seafoods, Inc.,
Irvington, Va. 22480

John S. McGowan, President
Bumble Bee Seafoods, Inc.,
Box 60,
Astoria, Oreg. 97103

John Mehos
Liberty Corporations
P. O. Box 267,
7th & Wharf,
Galveston, Tex. 77550

Anthony Nizetich
Director of Government and
Industry Relations,
Star Kist Foods, Inc.,
Terminal Island, Calif. 93465

Einar Pedersen
8801 Golden Gardens Drive, N.W.,
Seattle, Wash. 98107

Roy Prewitt
American Fish Farmers Federation,
P. O. Box 191,
Lonoke, Ark. 72086

John Salvador
S. Salvador and Sons Co.,
P. O. Box 462,
158 King Street,
St. Augustine, Fla. 32084

Theodore H. Shepard
Schulman – Shepard, Inc.,
337 International Trade Mart,
New Orleans, La. 70130

Daniel H. Smith
Smith Brothers of Port Washington,
100 North Franklin Street,
P. O. Box 246,
Port Washington, Wis. 53074

W. O. Smith
3104 Tongass Avenue,
Ketchikan, Alaska 99901

Robert D. Balkovic, Executive Secretary
Bureau of Commercial Fisheries

Appendix E—Organizations With Which the Bureau Had Research and Development Contracts and Grants in 1966

Organization	*Location*
Alabama Department of Conservation	Montgomery, Ala.
Alaska Department of Fish and Game	Juneau, Alaska
Alaska, University of	College, Alaska
American Scientific Corp.	Alexandria, Va.
Arizona Fish and Game Department	Phoenix, Ariz.
Arkansas Game and Fish Commission	Little Rock, Ark.
Batelle Northwest Laboratory	Richland, Wash.
Boeing Company	Seattle, Wash.
California Academy of Sciences	San Francisco, Calif.
California Department of Fish and Game	Sacramento, Calif.
California, University of	Berkeley, Calif.
Colorado Game, Fish and Parks Department	Denver, Colo.
Connecticut Board of Fisheries and Game	Hartford, Conn.
Cornell University	Ithaca, N.Y.
Delaware Commission of Fisheries	Dover, Del.
Delaware, University of	Newark, Del.
Duke University	Durham, N.C.
Florida Board of Conservation	Tallahassee, Fla.
Florida State University	Tallahassee, Fla.
Florida, University of	Gainesville, Fla.
Georgetown University	Washington, D.C.
Georgia State Game and Fish Commission	Atlanta, Ga.
Georgia, University of	Athens, Ga.
Guam, Government of	Agana, Guam
Gulf Coast Research Laboratory	Ocean Springs, Miss.
Harvard University	Cambridge, Mass.
Hawaii, University of	Honolulu, Hawaii
Hawaii Division of Fish and Game	Honolulu, Hawaii
Idaho Department of Fish and Game	Boise, Idaho
Idaho, University of	Moscow, Idaho
Indiana Department of Natural Resources	Indianapolis, Ind.
Indiana University	Bloomington, Ind.
Iowa State Conservation Commission	Des Moines, Iowa
Johns Hopkins University	Baltimore, Md.
Kansas Forestry, Fish and Game Commission	Pratt, Kans.
Kentucky Department of Fish and Wildlife Resources	Frankfort, Ky.
Long Beach California State College	Long Beach, Calif.
Louisiana Wildlife and Fisheries Commission	New Orleans, La.
Louisiana, University of Southwestern	Lafayette, La.
Louisville, University of	Louisville, Ky.
Maine Department of Sea and Shore Fisheries	Augusta, Maine
Maryland, University of	College Park, Md.
Maryland Department of Chesapeake Bay Affairs	Annapolis, Md.
Massachusetts Department of Natural Resources	Boston, Mass.
Massachusetts Institute of Technology	Cambridge, Mass.
Massachusetts, University of	Amherst, Mass.
Miami, University of	Miami, Fla.
Michigan State University	East Lansing, Mich.

Organization	*Location*
Michigan, University of	Ann Arbor, Mich.
Michigan Department of Conservation	Lansing, Mich.
Minnesota Department of Conservation	St. Paul, Minn.
Missouri, University of	Columbia, Mo.
Missouri Department of Conservation	Jefferson City, Mo.
Mississippi Marine Conservation Commission	Biloxi, Miss.
Montana Fish and Game Department	Helena, Mont.
Mt. Auburn Research Associates	Cambridge, Mass.
National Science Foundation	Washington, D.C.
Nebraska, University of	Lincoln, Nebr.
New Hampshire Fish and Game Commission	Concord, N.H.
New Jersey Department of Conservation	Trenton, N.J.
New York Department of Conservation	Albany, N.Y.
North Carolina State University	Raleigh, N.C.
North Dakota Fish and Game Commission	Bismarck, N. Dak.
North Dakota State University	Fargo, N. Dak.
Ohio Department of Natural Resources	Columbus, Ohio
Oregon Game Commission	Portland, Oreg.
Oregon State Fish Commission	Portland, Oreg.
Oregon State University	Corvallis, Oreg.
Philadelphia General Hospital	Philadelphia, Pa.
Pierre Laclede Fur Company	St. Louis, Mo.
Puerto Rico Department of Agriculture	San Juan, P.R.
Rhode Island Department of Natural Resources	Providence, R.I.
Rhode Island, University of	Kingston, R.I.
Rutgers University	New Brunswick, N.J.
Scripps Institution of Oceanography	La Jolla, Calif.
South Carolina Department of Wildlife Resources	Charlestown, S.C.
South Dakota Department of Fish, Game and Parks	Pierre, S. Dak.
South Florida, University of	Tampa, Fla.
Texas Department of Parks and Wildlife	Austin, Tex.
Tennessee Game and Fish Commission	Nashville, Tenn.
Texas, University of	Austin, Tex.
Tufts University	Medford, Mass.
Virginia Commission of Fisheries	Newport News, Va.
Virginia Institute of Marine Science	Gloucester Point, Va.
Virginia, University of	Charlottesville, Va.
Wisconsin, Department of Conservation	Madison, Wis.
Wisconsin, University of	Madison, Wis.
Woods Hole Oceanographic Institution	Woods Hole, Mass.
Washington State Department of Fisheries	Olympia, Wash.
Washington, University of	Seattle, Wash.

Appendix F—Budget for Fiscal Year 1966

Function	Appropriations								Other funds		
	Management and investigations of resources	Special foreign currency program	Construction	Construction of fishing vessels	Federal aid for commercial fisheries	General administrative expenses	Administration of Pribilof Islands	Fishery promotion and development [1]	Contributed funds	Reimbursements	Total
	Thousand dollars	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*	*Thousand dollars*
Management	496									2	498
Marketing and technology	5,380	140						2,240	759	595	9,114
Research	12,390	160						2,509	798	628	16,485
Research on fish migration over dams	1,446							204		149	1,799
Fishing vessel mortgage insurance	45										45
Colombia River fishery facilities	2,392		1,000							159	3,551
Construction of fishery facilities			980							4	984
Construction of fishing vessels				7,105							7,105
Aid to States					[2] 4,278						4,278
Fishery resources disaster aid					400						400
General administrative services					35	689		410	40	8	1,182
Administration of Pribilof Islands							2,166			54	2,220
Fur seal research							298				298
Fisheries Advisory Committee								37			37
Total	[3] 22,149	300	1,980	7,105	4,713	689	2,464	5,400	[4] 1,597	1,599	47,996

[1] Funds made available under Public Law 466, 83d Cong. (known as the Saltonstall–Kennedy Act of 1954).
[2] Includes $178 for program administration.
[3] Includes $116 comparative transfer from the Office of the Commissioner of Fish and Wildlife.
[4] Includes $792 from the Great Lakes Fishery Commission and $675 for inspection and grading of fishery products.

Appendix G—Physical Properties

G–1.—*Principal laboratories and installations, calendar year 1966*

Location	Type	Principal use	Gross valuation [1]
Alaska:			
Auke Bay	Biological Laboratory	Biological research	$436,000
Juneau	Exploratory Fishing and Gear Research Base, warehouse and shops.	Exploratory fishing and gear research, vessel maintenance, loans and grants.	[2] 145,000
Ketchikan	Technological Laboratory	Technological research	195,000
Pribilof Islands	Fur seal processing facilities and native villages.	Management of Alaska fur seals.	2,912,000
California:			
La Jolla	Biological Laboratory	Biological research	2,600,000
Stanford	do	do	[3]
Connecticut, Milford	do	do	92,000
District of Columbia:			
U.S. National Museum	Ichthyological Laboratory	do	[3]
Florida:			
Gulf Breeze	Biological Laboratory	do	62,000
Miami	do	do	1,500,000
Georgia, Brunswick	do	do	[3]
Hawaii, Honolulu	do	Biological research, loans and grants, statistics.	315,000
Maine, Boothbay Harbor	do	Biological research	[2] 211,000
Maryland:			
College Park	Technological Laboratory	Technological research, home economics.	84,000
Oxford	Biological Laboratory	Biological research, statistics	207,000
Massachusetts:			
Gloucester	Technological Laboratory	Technological research, fishery products inspection.	334,000
Do	Exploratory Fishing and Gear Research Base.	Exploratory fishing and gear research.	65,000
Woods Hole	Biological Laboratory	Biological research	1,029,000
Michigan, Ann Arbor	Biological Laboratory, Technological Station, Exploratory Fishing and Gear Research Station.	Biological and technological research, exploratory fishing and gear research, marketing development, statistics.	1,500,000
Mississippi, Pascagoula	Exploratory Fishing and Gear Research Base, Technological Laboratory.	Exploratory fishing and gear research, market development, biological and technological research.	370,000
North Carolina, Beaufort	Biological Laboratory	Biological research, statistics	595,000
Texas, Galveston	do	Biological research	351,000
Washington, Seattle	Biological Laboratories, Technological Laboratory, Exploratory Fishing and Gear Research Base, dock and warehouse.	Biological and technological research, exploratory fishing and gear research, Pribilof Islands supply, fishery products inspection.	[2] 2,142,000
Puerto Rico, Mayaguez	Technological Laboratory	On loan to University of Puerto Rico.	

[1] Figures shown are original acquisition or construction costs.
[2] Installations at this location are both owned and leased by Bureau of Commercial Fisheries.
[3] Installation not owned by Bureau of Commercial Fisheries. Includes property held under leases, cooperative agreements, and use permits.

G-2.—*Minor field research stations, market news offices, exploratory fishing stations, market development offices, and statistical offices, calendar year 1966*

Location	Type	Principal use	Gross valuation [1]
Alabama, Bayou LaBatre	Statistical Field Office	Statistics reporting	(2)
Alaska:			
Brooks Lake	Field Research Station	Biological research	$44,000
Juneau	Statistical Field Office	Statistics	(3)
Karluk Lake	Field Research Station	Biological research	27,000
Kasitsna Bay	do	do	12,000
Little Port Walter	do	do	158,000
Olsen Bay	do	do	7,000
St. Paul Island	do	do	
Traitors Cove	do	do	8,000
California:			
Los Angeles	Inspection Office	Inspection	(2)
San Pedro	Market News and Statistics Office.	Market news and statistics reporting.	(2)
San Francisco	Marketing and Inspection Office.	Marketing, inspection	(2)
Terminal Island	Marketing Office and Technological Station.	Technological research on fishery products.	(2)
Florida:			
Apalachicola	Statistical Field Office	Statistics reporting	(2)
Fort Myers	do	do	(2)
Key West	do	do	(2)
Miami	do	Statistics and biological research.	(2)
St. Petersburg Beach	Field Research Station, Inspection Office, and Marketing.	Biological research, fishery products inspection, marketing.	(2)
Tampa	Statistical Field Office	Statistics reporting	(2)
Georgia:			
Atlanta	Marketing Office	Marketing	(2)
Brunswick	Statistical Field Office	Statistics	(2)
St. Simons Island	Exploratory Fishing and Gear Research Station.	Exploratory fishing and gear research.	(2)
Hawaii, Honolulu	Statistical Office	Statistics	(4)
Idaho, Boise	Field Research Station	Biological research	(2)
Illinois:			
Chicago	Market News Office, Fishery Products Inspection Office.	Market news reporting, fishery products inspection.	(2)
Do National	Marketing Services Office	Marketing services	(2)
Louisiana:			
Galiano	Statistical Field Office	Statistics	(2)
Houma	do	Statistics reporting	(2)
Morgan City	do	do	(2)
New Orleans	Market News Office, Statistical Field Office.	do	(2)
Maine:			
Portland	Field Office	Statistics, market news, biological research.	(2)
Rockland	do	do	(2)
West Boothbay Harbor	Statistical Field Office	Statistics	(2)
Maryland:			
Baltimore	Market News Office, Marketing.	Market news reporting, marketing.	(2)
College Park	National Home Economics Research Center.	Test kitchen research	(2)
Salisbury	Statistical Field Office	Statistics	(2)
Massachusetts:			
Boston	Market News Office, Marketing.	Market news reporting, statistics, biological and technological research, marketing.	(2)
Gloucester	Field Offices	Statistics, biological research, fishery products inspection.	(2)
New Bedford	Field Office	Statistics, biological research, market news reporting.	(2)
Provincetown	Statistical Field Office	Statistics, market news reporting.	(2)

See footnotes at end of table.

G–2.—*Minor field research stations, market news offices, exploratory fishing stations, market development offices, and statistical offices, calendar year 1966*—Continued

Location	Type	Principal use	Gross valuation [1]
Michigan:			
Ann Arbor	Marketing Office	Marketing	[2]
Hammond Bay	Field Research Station	Biological research	[2]
Ludington	do	do	[2]
Marquette	do	do	[2]
Minnesota, St. Paul	Marketing Office	Marketing	[2]
Mississippi:			
Ocean Springs	Statistical Field Office	Statistics and market news reporting.	[2]
Pascagoula	Marketing Office	Marketing	[2]
Missouri, St. Louis	do	do	[2]
New Jersey, Toms River	Statistical Field Office	Statistics	[2]
New York:			
Bayport, Long Island	do	do	[2]
New York City	Market News Office, Marketing, Fishery Products Inspection Office.	Market news reporting, marketing, fishery products inspection.	[2]
Ohio:			
Cleveland	Marketing Office	Marketing	[2]
Sandusky	Field Research Station	Biological research	[2]
Oregon:			
Eugene	do	do	[2]
Portland	do	do	[2]
Rhode Island:			
Point Judith	Field Station	Statistics, biological research	[2]
Warren	Statistical Field Office	Statistics	[2]
South Carolina, Charleston	do	do	[2]
South Dakota, Mobridge	Field Research Station and Exploratory Fishing Base.	Biological research and exploratory fishing gear research.	[2]
Tennessee, Camden	Statistical Office	Statistics	[2]
Texas:			
Aransas Pass	Statistical Field Office	do	[2]
Brownsville	Statistical Field Office, Fishery Products Inspection Office.	Statistics, fishery products inspection.	[2]
Dallas	Marketing Office	Marketing	[2]
Freeport	Statistical Field Office	Statistics	[2]
Galveston	do	do	[2]
Port Arthur	do	do	[2]
Port Isabel	do	do	[2]
Virginia:			
Franklin City	Field Research Station	Biological research	[2]
Hampton	Market News Office	Market news reporting	[2]
Norfolk	Statistical Field Office	Statistics	[2]
Weems	do	do	[2]
Washington:			
North Bonneville	Field Research Station	Biological research	[2]
Seattle	Market News, Statistical, and Inspection Office.	Market news reporting, statistics, loans and grants.	[2]
Do	Marketing Office	Marketing	[2]
Wisconsin:			
Ashland	Field Research Station	Biological research	[2]

[1] Figures shown are original acquisition or construction costs.
[2] Installation not owned by Bureau of Commercial Fisheries. Includes property held under leases, cooperative agreements, and use permits.
[3] Installations at this location are both owned and leased by Bureau of Commercial Fisheries.

G–3.—*Bureau of Commercial Fisheries vessel fleet, calendar year 1966*

Name of vessel	Home port	Length (feet)	Year built	Cost or estimated value	Horsepower	Mission
Pribilof	Seattle, Wash	222	1954	$2,200,000	1,500	Transportation of supplies and personnel to the Pribilof Islands fur seal stations.
Albatross IV	Woods Hole, Mass.	187	1962	2,000,000	1,100	Fishery and biological research studies; oceanographic studies in Atlantic waters.
Geo. B. Kelez	Seattle, Wash	176	1944	805,000	1,000	High-seas salmon investigation and oceanography.
David Starr Jordan.	San Diego, Calif	171	1965	2,000,000	900	Oceanography; sardine ecology; studies on biology of other commercial species.
Townsend Cromwell.	Honolulu, Hawaii	158	1963	1,049,935	800	Pacific oceanography; tuna biology, behavior, and distribution.
Delaware	Gloucester, Mass	147	1937	302,473	735	Exploratory fishing and biological studies on the groundfishes and sea scallops, gear research.
Black Douglas	San Diego, Calif	152	1926	75,000	325	Biology, distribution, spawning of the Pacific sardine; abundance and life history studies of other commercial species.
Geronimo	Galveston, Tex	143	1944	1,000,000	2,000	Fishery oceanographic research and shrimp studies.
Undaunted	Miami, Fla	143	1944	1,000,000	1,850	Fishery oceanographic research.
Charles H. Gilbert.	Honolulu, Hawaii	123	1952	409,890	640	Pacific oceanography; tuna biology, behavior, and distribution.
Oregon	Pascagoula, Miss	100	1950	300,000	600	Exploratory fishing for shrimp, tuna, and other potentially commercial species; gear research.
John N. Cobb	Seattle, Wash	93	1950	235,392	500	Exploratory fishing for pelagic and bottom fish, shrimp and crabs; gear research.
Murre II	Juneau, Alaska	86	1943	64,000	115	Oceanographic studies in coastal waters of Southeastern Alaska with limited use for servicing shore facilities.
John R. Manning.	do	86	1950	181,600	320	Bottom surveys for halibut; patrol work; observations on foreign fishing activities in Bering Sea.
Geo. M. Bowers	Panama City, Fla	73	1956	93,800	210	Primarily gear research.
Kaho	Saugatuck, Mich	65	1961	85,000	-------	Exploratory fishing and gear research on industrial fishes, chubs, alewives, sheepshead, gizzard shad, and smelt.
Rorqual	Gloucester, Mass	64	1941	187,000	230	Gear research and inshore exploration on herring and shellfish.
T–19	South Carolina	64	1942	187,000	-------	On loan to State of South Carolina.
Cisco	Saugatuck, Mich	60	1950	85,000	175	Research on deepwater fish species, their distribution, abundance, and ecology; limnology.
Heron	Juneau, Alaska	58	1940	19,000	135	Salmon and herring research.
Musky II	Sandusky, Ohio	53	1931	3,666	170	Studies on warm-water fishes of Lake Erie; limnology; pollution studies.
Siscowet	Ashland, Wis	52	1946	81,000	170	Research on deepwater fish species, their distribution, abundance, and ecology; limnology.
Shang Wheeler	Milford, Conn	50	1951	45,840	140	Shellfish research; oyster and clam propagation; predator control.
Alosa	Oxford, Md	48	1941	6,500	82	Shellfish research; oyster propagation and disease studies.

G–3.—*Bureau of Commercial Fisheries vessel fleet, calendar year 1966*—Continued

Name of vessel	Home port	Length (feet)	Year built	Cost or estimated value	Horse-power	Mission
Hiodon	Mobridge, S. Dak.	46	1965	$24,156	190	Research on reservoir fish species.
J-3486	North Carolina	43	1942	28,000		On loan to State of North Carolina.
Kingfish	St. Petersburg Beach, Fla.	43	1954	24,500	150	Estuarine investigations.
J-1110	Beaufort, N.C	40	1934	15,000	200	Research on shellfish, striped bass, and other coastal species; collection of samples for radiobiological studies.
Phalarope II	Boothbay Harbor, Maine.	40	1932	8,000	225	Clam and herring studies.
Sockeye	King Salmon, Alaska.	40	1946	11,250	175	Salmon research work.

Appendix H—Fish and Wildlife Service Publication Series and a 1966 List of Publications by Bureau Personnel

The regular, established series of the Fish and Wildlife Service in which Bureau of Commercial Fisheries publications appear are:

Fishery Bulletin.—Technical reports on scientific investigations of fishery biology. The Bulletin of the United States Fish Commission was begun in 1881; it became the Bulletin of the Bureau of Fisheries in 1904 and the Fishery Bulletin of the Fish and Wildlife Service in 1941. Separates were issued as documents through volume 46; the last document was No. 1103. Beginning with volume 47 in 1931 and continuing through volume 62 in 1963, each separate appeared as a numbered bulletin. A new system began in 1963 with volume 63 in which papers are bound together in a single issue of the bulletin instead of being issued individually. Volume 65, nos. 2 and 3 (389 p.) were issued in 1966. Some bulletins are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402; they are distributed free to libraries and to a limited number of scientific cooperators.

Fishery Industrial Research.—Technical reports dealing with scientific investigations of fishery technology, economics, exploratory fishing, and gear research. Nos. 2 and 3 (10 papers, 135 p.) of volume 3 were published in 1966. They are distributed free to libraries and to a limited number of scientific cooperators.

Special Scientific Report—Fisheries.—Preliminary or progress reports and reports on scientific investigations of restricted scope. Established as Special Scientific Reports in 1940, nos. 1 to 67 were issued from that date to 1949, when the new series, Special Scientific Report—Fisheries, with new serial numbering, was started. Seventeen of these reports (500 p.) were published in 1966. They are distributed free to libraries and cooperators on a limited mailing list.

Fishery Leaflet.—Popular information on fishery subjects intended primarily for use in correspondence. Fifteen leaflets (211 p.) were published in 1966. They are distributed free on request.

Circular.—Popular and semitechnical publications of general and regional interest intended to aid conservation and management. Sixteen circulars (549 p.) were published in 1966. They have free, but limited distribution.

Data Report.—Reports that include compilations of unanalyzed or partially analyzed data collected during biological, limnological,

or oceanographic investigations. The reports were originally printed as 3– by 5–inch microfiche, each of which has up to 40 pages of material. In June 1965, the Bureau began using the 4– by 6–inch size of microfiche which holds up to 70 pages. The pages are reduced to one–eighteenth normal size; consequently, they can be read only through a microscope, microfiche "reader," or any similar device for enlarging. The Data Report series is the first microfiche series to be used for primary publication of scientific reports. Advantages of microfiche over regular size reports are threefold. They occupy only about one–hundredth as much space; they can be printed in a matter of weeks rather than months; and for our distribution lists, the cost of printing and mailing is only about one–tenth as much. Data Reports 10, 11, 12, 13, and 14 (10 microfiches, 473 p.) were issued in 1966. They are distributed free to a restricted mailing list of laboratories, libraries, State fishery agencies, research institutions, and research scientists. [Hard (full–size) copy is available for purchase.]

Commercial Fisheries Abstracts.—A monthly abstract of world literature (chiefly English language) on fishery technology. Volume 19 in 1966 had 12 issues (348 p.). They have free, but limited distribution.

Commercial Fisheries Review.—A monthly periodical which features articles on Bureau research and operations and trends and developments in the domestic and foreign fisheries. Volume 28 in 1966 had 12 issues (1,215 p.). They are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price $6.50 a year; $2 additional for foreign mailing; single copies 60 cents each. Index for volume 27 (1965) of the Commercial Fisheries Review was issued also (72 p.).

Statistical Digest.—Annual statistics with detailed tabulations relating to fishery production, manufacture, and commerce. These succeeded the Administrative Report series. One digest (543 p.) was published in 1966. Digests are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402; some are distributed free to a limited mailing list.

Current Fishery Statistics.—Current statistical information on fishery production, manufacture, and domestic or foreign trade; issued monthly, quarterly, or annually by States, regions or larger areas. In 1966, the Branch of Fishery Statistics issued 330 Current Fishery Statistical publications totaling over 2,000 pages. In addition, considerable data were supplied to the Bureau's Branch

of Market News for release in its Fishery Products Reports. The Current Fishery Statistical publications are sent to private and Government industries in the United States, foreign industries, and United States embassies.

Fishery Products Report.—Daily (5 times a week), monthly and annual data on landings, receipts, supplies, prices, imports, movements of fish and fish products in local areas; market conditions; and fishery developments in the United States and foreign countries. Special Market News data reports also are issued sporadically. Seven Market News Service field offices prepare and mail these free reports. During 1966 the 1,770 daily reports totaled 5,558 pages; the 52 monthly, 5 complete annual reports, and 2 preliminary annual reports, 715 pages; and the 6 supplementary reports, 90 pages.

Current Economic Analysis.—These reports, begun in 1965, cover all major fishery commodities. One report will cover shellfish, a second will deal with food finfish. Each year one of the four issues in each series will be an annual review. The reports have text plus considerable tabular data and many charts to illustrate economic trends and conditions. During 1966 four of these reports (233 p.) were issued. They are distributed free to interested industry personnel.

Fishery Market Development Series.—This new series replaces the Test Kitchen series which provided information on buying, preparing, and cooking fish, with tested recipes for institutions, home economists, and homemakers. In addition to containing all publications of the type previously issued in the Test Kitchen series, the Fishery Market Development series contains publications on merchandising, marketing, distribution, and other material necessary for effective development of markets for fishery products. These publications are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20401. During 1966 three publications (58 p.) were issued.

Miscellaneous papers.—Three miscellaneous papers, totaling 95 pages, were issued. Some were distributed to the fish processing industry, and others were distributed to the mass news media, food brokers and distributors, agricultural demonstration agents, and home economists.

A detailed list of publications of the Bureau of Commercial Fisheries and its personnel or contractors or collaborators during 1966 follows. The articles are listed by authors.

Publications [1]

AHLSTROM, ELBERT H.

Distribution and abundance of sardine and anchovy larvae in the California Current region off California and Baja California, 1951–64: a summary. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 534, iii + 71 p.

ALLEN, DONALD M., AND T. J. COSTELLO.

Releases and recoveries of marked pink shrimp, *Penaeus duorarum* Burkenroad, in south Florida waters, 1958–64. U.S. Fish Wildl. Serv., Data Rep. 11, 2 microfiches (ii + 77 p.).

ALLEN, HAROLD B.

Salmonella research and surveillance programs – Bureau of Commercial Fisheries. Proc. Interdep. Conf. Salmonellosis, June 3–4, 1965: 18.

ALTON, MILES S.

A new sea-star from the northeastern Pacific Ocean, *Asthenactis fisheri* n. sp., with a review of the family Myxasteridae. Deep-Sea Res. 13(4): 687–697.

Bathymetric distribution of sea stars (Asteroidea) off the northern Oregon Coast. J. Fish. Res. Bd. Can. 23(11): 1673–1714.

ALVERSON, DAYTON L.

National and international implications of foreign fisheries. *In* Eleanor G. Viereck (editor), Science in Alaska, 1965: 14–23. Proc. 16th Alaskan Sci. Conf., Juneau, Alaska, Aug. 29–Sept. 1, 1965.

Soviet fishing and their problems. Part I—Russian fishing is planned operation. The Seattle Times, Seattle, Wash., June 29, 1966, p. 70; Part II—Big stern trawlers are pride of Soviet catcher fleet, June 30, 1966, p. 61; Part III—Effects of Russian fishing uncertain, July 1, 1966, p. 7.

The Soviet fisheries menace. Boat Owners News 1(1): 3, 13–14.

ALVERSON, DAYTON L., AND KENJI EGO.

Report of the Working Group on gear development. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 39–43.

ALVERSON, DAYTON L., AND EDWARD A. SCHAEFERS.

Methods of search and capture in ocean fisheries. Trans. 2d Annu. MTS Conf. Exhib. June 27–29, 1966—Exploiting the Ocean—Mar. Technol. Soc. (Washington, D.C.): 319–335.

ALVERSON, DAYTON L., AND NORMAN J. WILIMOVSKY.

Fishery investigations of the southeastern Chukchi Sea. *In* Norman J. Wilimovsky and John N. Wolfe (editors), Environment of the Cape Thompson Region, Alaska: 843–860. U.S. At. Energy Comm., Div. Tech. Inform., Oak Ridge, Tenn.

AMES, WARREN E., R. M.CONDIE, AND B. POLLARA.

A method for intravascular injection and bleeding of fishes. Trans. Amer. Fish. Soc. 95(3): 317–318.

---

[1] This list does not include Commercial Fisheries Abstracts, Current Fishery Statistics, and Commercial Fisheries Review, except a few articles for which the authors' names are given.

AMOS, MURRAY H.
Commercial clams of the North American Pacific Coast. U.S. Fish Wildl. Serv., Circ. 237, iii + 18 p.

ANDERSON, WILLIAM D., JR.
A new species of *Pristipomoides* (Pisces: Lutjanidae) from the tropical western Atlantic. Bull. Mar. Sci. 16(4): 814–826.

ANDERSON, WILLIAM W.
The shrimp and the shrimp fishery of the southern United States. U.S. Fish Wildl. Serv., Fish. Leafl. 589, 8 p.

ANDERSON, WILLIAM W., JACK W. GEHRINGER, AND FREDERICK H. BERRY.
Family Synodontidae. Lizardfishes. *In* Yngve H. Olsen and James W. Atz (editors), Fishes of the western North Atlantic: 30–102. Mem. Sears Found. Mar. Res. 1, pt. 5.

Field guide to the Synodontidae (lizardfishes) of the western Atlantic Ocean. U.S. Fish Wildl. Serv., Circ. 245, i + 12 p.

ANGELOVIC, J. W., J. C. WHITE, JR., AND D. W. ENGEL.
Influence of salinity on the response of estuarine animals to ionizing radiation. [Abstract.] ASB Bull. 13(2): 29.

ASHWORTH, U. S., G. D. RAMAIAH, AND MARK C. KEYES.
Species difference in the composition of milk with special reference to the northern fur seal. J. Dairy Sci. 49(10): 1206–1211.

AULL, FELICE.
Absorption of fluid from isolated intestine of the toadfish, *Opsanus tau*. Comp. Biochem. Physiol. 17(3): 867–870.

BAPTIST, JOHN P.
Uptake of mixed fission products by marine fishes. Trans. Amer. Fish. Soc. 95(2): 145–152.

BARRETT, IZADORE, JAMES JOSEPH, AND GEOFFREY MOSER.
Electrophoretic analysis of hemoglobins of California rockfish (genus *Sebastodes*). Copeia 1966(3): 489–494.

BARROW, JAMES H., JR., AND BRUCE C. TAYLOR.
Fluorescent-antibody studies of haplosporidian parasites of oysters in Chesapeake and Delaware Bays. Science 153(3743): 1531–1533.

BARRY, E. J.
Gulf fisheries (selected areas)—1965. U.S. Fish Wildl. Serv., Bur. Com. Fish., New Orleans Market News Serv., 39 p.

List of primary receivers of imported fishery products and byproducts, New Orleans, La., 1966. U.S. Fish Wildl. Serv., Bur. Com. Fish., New Orleans Market News Serv., 4 p.

BERRY, FREDERICK H., AND WAYNE J. BALDWIN.
Triggerfishes (Balistidae) of the eastern Pacific. Proc. Calif. Acad. Sci., 4th ser., 34(9): 429–474.

BERRY, FREDERICK H., AND HERBERT C. PERKINS.
Survey of pelagic fishes of the California Current area. U.S. Fish Wildl. Serv., Fish. Bull. 65: 625–682.

BLACKBURN, MAURICE.
Biological oceanography of the eastern tropical Pacific: summary of existing information. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 540, iii + 18 p.

BLUNT, C. E., JR., AND MAKOTO KIMURA.
Age, length composition, and catch localities of sardine landings on the Pacific Coast of the United States and Mexico in 1963–64. Calif. Fish Game 52(3): 133–150.

BODOLA, ANTHONY.
Life history of the gizzard shad, *Dorosoma cepedianum* (Le Sueur), in western Lake Erie. U.S. Fish Wildl. Serv., Fish. Bull. 65: 391–425.

BÖHLKE, JAMES E., AND DANIEL M. COHEN.
A new shallow-water ophidioid fish from the tropical West Atlantic. Notulae Naturae 396, 7 p.

BOSS, KENNETH J.
The subfamily Tellininae in the western Atlantic – the genus *Tellina* (Part I). Johnsonia 4(45): 217–272.

BROCK, VERNON E., AND RALPH P. SILLIMAN.
Report of the Working Group on Bigeye Tuna. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 36–38.

BROOKE, RICHARD O., ELINOR M. RAVESI, DONALD F. GADBOIS, AND MAYNARD A. STEINBERG.
Preservation of fresh unfrozen fishery products by low-level radiation. 5. The effects of radiation pasteurization on amino acids and vitamins in haddock fillets. Food Technol. 20(11): 99–102.

BULLIS, HARVEY R.
Engineering needs for fishery development. Trans. 2d Annu. MTS Conf. Exhib. June 27–29, 1966—Exploiting the Ocean—Mar. Technol. Soc. (Washington, D.C.): 342–347.

BULLIS, HARVEY R., AND JAMES S. CARPENTER.
Neoharriotta carri—a new species of Rhinochimaeridae from the southern Caribbean Sea. Copeia 1966(3): 443–450.

BUREAU OF COMMERCIAL FISHERIES.
An analysis of the present status and future potential of the Lake Superior commercial fishing industry. U.S. Dep. Com., Econ. Develop. Admin., Tech. Assistance Proj. 722, viii + 64 p.

Fancy catfish. U.S. Fish Wildl. Serv., Fish. Market Develop., ser. 6, 19 p. [Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20401; price 25¢.]

Fishery motion pictures. U.S. Fish Wildl. Serv., Fish. Leafl. 591, 24 p.

Graduate educational grants, academic year 1967–68. U.S. Fish Wildl. Serv., Fish. Leafl. 593, 5 p.

Inspectors' instructions for grading frozen fish blocks. Second issue. Document was prepared only for the guidance of fishery products inspectors (not for public distribution), i + 21 p.

BUREAU OF COMMERCIAL FISHERIES—Continued.

List of Circulars of the U.S. Fish and Wildlife Service. U.S. Fish Wildl. Serv., Fish. Leafl. 596, 13 p.

List of Fishery Bulletins of the U.S. Fish and Wildlife Service. U.S. Fish Wildl. Serv., Fish. Leafl. 597, 15 p.

List of Fishery Leaflets of the U.S. Fish and Wildlife Service. U.S. Fish Wildl. Serv., Fish. Leafl. 595, 29 p.

Seafood slimmers. U.S. Fish Wildl. Serv., Fish. Market Develop., ser. 7, 19 p. [Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20401; price 25¢.]

The letters from the captain's wife. U.S. Fish Wildl. Serv., Fish. Market Develop., ser. 4, 20 p. [Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20401; price 70¢.]

United States standards for grades of frozen headless dressed whiting. Fed. Reg. 31(135): 9542.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, BEAUFORT, N.C.

Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1965. U.S. Fish Wildl. Serv., Circ. 240, iv + 39 p.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, GALVESTON, TEX.

Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Galveston, Texas, fiscal year 1965. U.S. Fish Wildl. Serv., Circ. 246, iv + 51 p.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL LABORATORY, GULF BREEZE, FLA.

Annual report of the Bureau of Commercial Fisheries Biological Laboratory, Gulf Breeze, Florida, for the fiscal year ending June 30, 1965. U.S. Fish Wildl. Serv., Circ. 247, iii + 15 p.

BUREAU OF COMMERCIAL FISHERIES, BIOLOGICAL STATION, ST. PETERSBURG BEACH, FLA.

Report of the Bureau of Commercial Fisheries Biological Station, St. Petersburg Beach, Florida, fiscal years 1962–64. U.S. Fish Wildl. Serv., Circ. 239, iii + 26 p.

Report of the Bureau of Commercial Fisheries, Biological Station, St. Petersburg Beach, Florida, fiscal year 1965. U.S. Fish Wildl. Serv., Circ. 242, iv + 30 p.

BUREAU OF COMMERCIAL FISHERIES, BOSTON MARKET NEWS SERVICE.

New England fisheries monthly summary (1966). Ten issues, January to October, total 138 p.

BUREAU OF COMMERCIAL FISHERIES, BRANCH OF CURRENT ECONOMIC ANALYSIS.

Food fish situation and outlook, January–September 1966. U.S. Fish Wildl. Serv., Curr. Econ. Anal. F1, 83 p.

Shellfish situation and outlook. U.S. Fish Wildl. Serv., Curr. Econ. Anal. S1, 48 p.

Shellfish situation and outlook. U.S. Fish Wildl. Serv., Curr. Econ. Anal. S2, 55 p.

BUREAU OF COMMERCIAL FISHERIES—Continued.

Shellfish situation and outlook. U.S. Fish Wildl. Serv., Curr. Econ. Anal. S3, 47 p.

BUREAU OF COMMERCIAL FISHERIES, BRANCH OF FOREIGN TRADE AND ECONOMIC SERVICES.

List of fishermen's and fish shore workers' unions in the United States. U.S. Fish Wildl. Serv., Fish. Leafl. 581, i + 4 p.

BUREAU OF COMMERCIAL FISHERIES, CHICAGO MARKET NEWS SERVICE.

Monthly summary of Chicago's wholesale fishery products receipts, prices, and trends (1966). Four issues, July to October, total 4 p.

BUREAU OF COMMERCIAL FISHERIES, EXPLORATORY FISHING BASE, PASCAGOULA, MISS.

Annual report exploratory fishing and gear research, Bureau of Commercial Fisheries, Region 2, for fiscal year 1965. U.S. Fish Wildl. Serv., Circ. 249, iii + 33 p.

BUREAU OF COMMERCIAL FISHERIES, HAMPTON MARKET NEWS SERVICE.

Monthly summary of fishery products production in selected areas of Virginia, North Carolina, and Maryland (1966). Seven issues, January to May, July to August, total 24 p.

BUREAU OF COMMERCIAL FISHERIES, NEW ORLEANS MARKET NEWS SERVICE.

Gulf of Mexico monthly landings, ex-vessel prices, cold-storage holdings, and imports of shrimp (1966). Six issues, June to November, total 6 p.

BUREAU OF COMMERCIAL FISHERIES, NEW YORK MARKET NEWS SERVICE.

New York City's wholesale fishery trade monthly summaries (1966). Four issues, January to April, total 64 p.

BUREAU OF COMMERCIAL FISHERIES, RADIOBIOLOGICAL LABORATORY, BEAUFORT, N.C.

Annual report of the Bureau of Commercial Fisheries Radiobiological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1965. U.S. Fish Wildl. Serv., Circ. 244, iii + 50 p.

BUREAU OF COMMERCIAL FISHERIES, REGION 2, ST. PETERSBURG BEACH, FLA.

Annual report, exploratory fishing and gear research, Bureau of Commercial Fisheries, Region 2, for fiscal year 1964. U.S. Fish Wildl. Serv., Circ. 236, iv + 57 p.

Annual report, exploratory fishing and gear research, Bureau of Commercial Fisheries, Region 2, for fiscal year 1965. U.S. Fish Wildl. Serv., Circ. 249, iii + 33 p.

BUREAU OF COMMERCIAL FISHERIES, SAN PEDRO MARKET NEWS SERVICE.

California fishery products monthly summary (1966). Ten issues, January to October, total 145 p.

BUREAU OF COMMERCIAL FISHERIES, SEATTLE MARKET NEWS SERVICE.

Washington and Alaska receipts and landings of fishery products for selected areas and fisheries (1966). Eleven issues, January to November, total 91 p.

BUREAU OF COMMERCIAL FISHERIES, TECHNOLOGICAL LABORATORY, COLLEGE PARK, MD.

Marine protein concentrate. A summary report on the development of a proposed commercial manufacturing process and on the properties of a test sample. U.S. Fish Wildl. Serv., Fish. Leafl. 584, v + 27 p.

BUREAU OF COMMERCIAL FISHERIES, TECHNOLOGICAL LABORATORY, GLOUCESTER, MASS.

Annual report of the Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass., for the fiscal year ending June 30, 1964. U.S. Fish Wildl. Serv., Circ. 241, iii + 31 p.

BUTLER, CHARLES.

Research in review. Fish. Gaz. 83(1): 10–11; (2): 10–11; (3): 6, 12; (5): 12, 14; (6): 16, 21, 82; (7): 6, 56.

BUTLER, PHILIP A.

Fixation of DDT in estuaries. Trans. 31st N. Amer. Wildl. Natur. Resourc. Conf.: 184–189.

Pesticides in the marine environment. J. Appl. Ecol. 3(Suppl.): 253–259.

The problem of pesticides in estuaries. *In* A symposium on estuarine fisheries: 110–115. Amer. Fish. Soc., Spec. Publ. 3.

CABLE, LOUELLA E

Plankton. U.S. Fish Wildl. Serv., Fish. Leafl. 583, iii + 13 p.

CALABRESE, ANTHONY, AND HARRY C. DAVIS.

The pH tolerance of embryos and larvae of *Mercenaria mercenaria* and *Crassostrea virginica*. Biol. Bull. (Woods Hole, Mass.) 131(3): 427–436.

CALDWELL, DAVID K., MELBA C. CALDWELL, AND DALE W. RICE.

Behavior of the sperm whale, *Physeter catodon* L. *In* Kenneth S. Norris (editor), Whales, dolphins, and porpoises: 677–716. Univ. Calif. Press, Berkeley and Los Angeles.

CARPENTER, JAMES S.

Capture of immature *Oxynotus caribbaeus* Cervigon from the type locality. Copeia 1966(2): 356–357.

CARROLL, BOBBY J., EPHRAIM S. GARRETT, GLADYS B. REESE, AND BENJAMIN Q. WARD.

Presence of *Clostridium botulinum* in the Gulf of Venezuela and the Gulf of Darien. Appl. Microbiol. 14(5): 837–838.

CARROLL, BOBBY J., TRAVIS D. LOVE, BENJAMIN Q. WARD, AND MELVIN E. WATERS.

Microbial analyses of frozen raw breaded shrimp. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(3): 5–11.

CARVER, THOMAS C., JR.

Rapid method for determining water content in oyster tissue. U.S. Fish Wildl. Serv., Fish. Bull. 65: 685–686.

CHAMBERLIN, J. LOCKWOOD.

A further note on the construction of the pyramids. Geogr. Rev. 16(2): 282–283.

CHAPMAN, CHARLES R.
The Texas Basins project. *In* A symposium on estuarine fisheries: 83–92. Amer. Fish. Soc., Spec. Publ. 3.

CHAPOTON, ROBERT B.
A tank for transporting adult American shad. Progr. Fish-Cult. 28(2): 116.

CHARM, S. E., AND P. MOODY.
Bound water in haddock muscle. ASHRAE J. 8(4): 39–42.

CHARNELL, ROBERT L., AND GUNTER R. SECKEL.
The circulation in the trade wind zone of the central North Pacific: 1964–65. [Abstract.] Abstracts of Papers Related with Oceanography, Divisional Meeting on Physical Oceanography: 19. Proc. 11th Pac. Sci. Congr. 2.

CHASE, JOSEPH.
Oceanographic observations, 1963, east coast of the United States. U.S. Fish Wildl. Serv., Data Rep. 10, 3 microfiches (iv + 173 p.).

CHEEK, RANDALL P.
Pugheaded striper. Wildl. N.C. 30(6): 27.

COHEN, DANIEL M.
A new tribe and a new species of ophidioid fish. Proc. Biol. Soc. (Washington, D.C.) 79: 183–204.

The north Pacific deepsea fish name *Bathylagus milleri* Gilbert, a senior synonym of *Bathylagus alascanus* Chapman. Copeia 1966(4): 877–878.

COLLETTE, BRUCE B.
A review of the venomous toadfishes, subfamily Thalassophryninae. Copeia 1966(4): 846–864.

Belonion, a new genus of fresh-water needlefishes from South America. Amer. Mus. Novit. 2274: 1–22.

Revue critique des types de Scombridae des collections du Muséum National d'Histoire Naturelle de Paris. Bull. Mus. Hist. Nat., Paris, 2d ser., 38(4): 362–375.

COLLETTE, BRUCE B., AND FREDERICK H. BERRY.
Proposed suppression of three *Nomina oblita* in the family Belonidae (Pisces). Z.N.(S.) 1723. Bull. Zool. Nomencl. 22(5/6): 325–329.

COLLETTE, BRUCE B., AND LESLIE W. KNAPP.
Catalog of type specimens of the darters (Pisces, Percidae, Etheostomatini). Proc. U.S. Nat. Mus. 119(3550): 1–88.

CONNORS, THOMAS J., AND MAYNARD A. STEINBERG.
Preservation of fresh unfrozen fishery products by low-level radiation. IV. Organoleptic studies on radiation-pasteurized skinless haddock fillets. Food Technol. 20(10): 117–119.

COOK, HARRY L.
A generic key to the protozoean, mysis, and postlarval stages of the littoral Penaeidae of the northwestern Gulf of Mexico. U.S. Fish Wildl. Serv., Fish. Bull. 65: 437–447.

COOPER, RICHARD A.
Migration and population estimation of the tautog, *Tautoga onitis*, (Linnaeus), from Rhode Island. Trans. Amer. Fish. Soc. 95(3): 239–247.

COSTELLO, T. J., AND DONALD M. ALLEN.
Migrations and geographic distribution of pink shrimp, *Penaeus duorarum*, of the Tortugas and Sanibel grounds, Florida. U.S. Fish Wildl. Serv., Fish. Bull. 65: 449–459.

COSTLOW, JOHN D., JR., AND A. N. SASTRY.
Free amino acids in developing stages of two crabs, *Callinectes sapidus* Rathbun and *Rhithropanopeus harrisii* (Gould). Acta Embryol. Morphol. Exp. 9: 44–55.

COUCH, JOHN A.
Brachycoelium ambystomae sp. n. (Trematoda: Brachycoeliidae) from *Ambystoma opacum*. J. Parasitol. 52(1): 46–49.

Two peritrichous ciliates from the gills of the blue crab. Chesapeake Sci. 7(3): 171–173.

COUCH, JOHN A., C. AUSTIN FARLEY, AND AARON ROSENFIELD.
Sporulation of *Minchinia nelsoni* (Haplosporida, Haplosporidiidae) in *Crassostrea virginica* (Gmelin). Science 153(3743): 1529–1531.

CROWTHER, H. E.
Voluntary versus mandatory inspection in the seafoods industry. Proc. Gulf Carib. Fish. Inst., 18th Annu. Sess.: 51–56.

CRUM, JOHN F.
Report on menhaden. Fish. Gaz. 83(2): 29–30.

CUMMING, KENNETH B.
Disposable aquaria. Progr. Fish-Cult. 28(2): 92.

CUMMINS, ROBERT, JR.
Hard-clam explorations off southeastern United States. Com. Fish. Rev. 28(12): 33–42.

DICAPUA, RICHARD A.
On the application of immunological techniques in geographic group studies of Atlantic sea herring, *Clupea harengus*. J. Exp. Zool. 161(1): 1–13.

DI MARCO, P.
List of Chicago brokers and importers of fishery products and by-products. U.S. Fish Wildl. Serv., Bur. Com. Fish., Chicago Market News Serv., 6 p.

Receipts and prices of fresh and frozen fishery products at Chicago, 1965 (preliminary). U.S. Fish Wildl. Serv., Bur. Com. Fish., Chicago Market News Serv., 49 p.

DRAGOVICH, ALEXANDER, AND JOHN A. KELLY, JR.
Distribution and occurrence of *Gymnodinium breve* on the west coast of Florida, 1964–65. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 541, iii + 15 p.

DRAGOVICH, ALEXANDER, JOHN A. KELLY, JR., AND JOHN H. FINUCANE.
Oceanographic observations of Tampa Bay, Charlotte Harbor, Pine Island Sound, Florida, and adjacent waters of the Gulf of Mexico, February 1964 through February 1965. U.S. Fish Wildl. Serv., Data Rep. 13, 2 microfiches (ii + 73 p.).

DRYER, WILLIAM R.
Bathymetric distribution of fish in the Apostle Islands region, Lake Superior. Trans. Amer. Fish. Soc. 95(3): 248–259.

DUKE, THOMAS W., JOHN P. BAPTIST, AND DONALD E. HOSS.
Bioaccumulation of radioactive gold used as a sediment tracer in the estuarine environment. U.S. Fish Wildl. Serv., Fish. Bull. 65: 427–436.

DUKE, THOMAS W., JAMES N. WILLIS, AND THOMAS J. PRICE.
Cycling of trace elements in the estuarine environment. 1. Movement and distribution of zinc 65 and stable zinc in experimental ponds. Chesapeake Sci. 7(1): 1–10.

DYER, JOHN A., RICHARD W. NELSON, AND HAROLD J. BARNETT.
Pacific hake *(Merluccius productus)* as raw material for a fish reduction fishery. Com. Fish. Rev. 28(5): 12–17.

EBLE, ALBERT F.
Seasonal distribution of alkaline and acid phosphatase and non-specific esterase in the normal and diseased American oyster as revealed by enzyme histochemistry. [Abstract.] Amer. Zool. 6(3): 339.

Some observations on the seasonal distribution of selected enzymes in the American oyster as revealed by enzyme histochemistry. Proc. Nat. Shellfish. Ass. 56: 37–42.

EDWARDS, ROBERT L., AND A. S. MERRILL.
Seasonal cycle of temperature in the Middle Atlantic. [Abstract.] Second Internat. Oceanogr. Congr., Moscow, 1966, Abstracts of Papers:105.

EKLUND, MELVIN W.
Incidence of *Clostridium botulinum* on Pacific Coast of the United States. Shellfish Sanit. Res. Plann. Conf. 1965 Proc.: 70–72.

EKLUND, M. W., J. SPINELLI, D. MIYAUCHI, AND J. DASSOW.
Development of yeast on irradiated Pacific crab meat. J. Food Sci. 31(3): 424–431.

EMERSON, J. A., N. KAZANAS, R. H. GNAEDINGER, R. A. KRZECZKOWSKI, H. L. SEAGRAN, P. MARKAKIS, R. C. NICHOLAS, B. S. SCHWEIGERT, AND L. L. KEMPE.
Irradiation preservation of fresh-water fish and inland fruits and vegetables. 63 p. Prepared for Div. Isotop. Develop., U.S. At. Energy Comm., Contract Number (AT-11-1)-1283, Report Number COO 1283-40, Isotop.-Ind. Technol. UC 23, TID 4500 (19th ed.). [Available from the Clearing House for Federal Scientific and Technical Information, U.S. Department of Commerce, Springfield, Va. 22151; price $1.50.]

EMERSON, J. A., N. KAZANAS, R. A. GREIG, H. L. SEAGRAN, AND L. L. KEMPE.
Irradiation preservation of freshwater fish. I. Extension of refrigerated storage life of fresh yellow perch fillets. Food Technol. 20(2): 108–110.

EMERY, K. O., AND R. L. EDWARDS.
Archaeological potential of the Atlantic Continental Shelf. Amer. Antiquity 31(5): 733–737.

ENGEL, DAVID W., JOSEPH W. ANGELOVIC, AND EDNA M. DAVIS.
Effects of acute gamma irradiation on the blood constituents of pinfish, *Lagodon rhomboides*. Chesapeake Sci. 7(2): 90–94.

ESCHMEYER, WILLIAM N., AND BRUCE B. COLLETTE.
The scorpionfish subfamily Setarchinae, including the genus *Ectreposebastes*. Bull. Mar. Sci. 16(2): 349–375.

FARRAGUT, ROBERT N., AND MARY H. THOMPSON.
Proximate composition of the Pacific Coast Dungeness crab *(Cancer magister)*. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(3): 1–4.

FINCH, ROLAND.
Fish and shellfish. *In* Kirk-Othmer Encyclopedia of chemical technology 9: 316–335. 2d ed. Interscience Publishers, a division of John Wiley & Sons, Inc., New York, London, and Sydney.

FINUCANE, JOHN H., AND ALEXANDER DRAGOVICH.
Hydrographic observations in Tampa Bay, Florida, and the adjacent Gulf of Mexico—1963. U.S. Fish Wildl. Serv., Data Rep. 14, 2 microfiches (ii + 81 p.).

FISCUS, CLIFFORD H., AND GARY A. BAINES.
Food and feeding behavior of Steller and California sea lions. J. Mammal. 47(2): 195–200.

FLOYD, HILTON M.
Commercial flounder gigging. U.S. Fish Wildl. Serv., Fish. Leafl. 586, iii + 5 p.

Wade seine construction and method of use. Com. Fish. Rev. 28(1): 8–11.

FRENCH, ROBERT R., AND ROY J. WAHLE.
Study of loss and delay of salmon passing Rock Island Dam, Columbia River, 1954–56. U.S. Fish Wildl. Serv., Fish. Bull. 65: 339–368.

FUJINO, KAZUO.
Instructions for collecting blood and serum samples from tuna fishes. Food Agr. Organ., Fish. Circ. 26, 5 p.

FUJINO, KAZUO, AND LUCIAN M. SPRAGUE.
Genetic study of the red blood cells and serum components of skipjack and yellowfin tunas. [Abstract.] Abstracts of Papers Related with Fisheries, Marine and Freshwater Science, Divisional Meeting on Fisheries Sciences: 2. Proc. 11th Pac. Sci. Congr. 7.

FUSS, C. M., JR., AND LARRY H. OGREN.
Factors affecting activity and burrowing habits of the pink shrimp *(Penaeus duorarum)*. Biol. Bull. (Woods Hole, Mass.) 130(2): 170–191.

GILL, CHARLES D., AND DONALD M. FISK.
Vertebral abnormalities in sockeye, pink, and chum salmon. Trans. Amer. Fish. Soc. 95(2): 177–182.

GLUDE, JOHN B.
Criteria of success and failure in the management of shellfisheries. Trans. Amer. Fish. Soc. 95(3): 260–263.

GNAEDINGER, R. H., AND R. A. KRZECZKOWSKI.
Heat inactivation of thiaminase in whole fish. Com. Fish. Rev. 28(8): 11–14.

GOSLINE, WILLIAM A., NORMAN B. MARSHALL, AND GILES W. MEAD.
Order Iniomi. Characters and synopsis of families. Mem. Sears Found. Mar. Res. 1(5): 1–18.

GOULD, EDITH.
Stability of malic enzyme in fish flesh at +3° C. J. Food Sci. 31(6): 829–832.

GRAHAM, JOSEPH J.
Coastal oceanography in the Gulf of Maine, 1962–65. [Abstract.] Second Int. Oceanogr. Congr., Abstr. Pap., Moscow: 142–143.

Secchi disc observations and extinction coefficients in the central and eastern North Pacific Ocean. Limnol. Oceanogr. 11(2): 184–190.

GRAHAM, JOSEPH J., AND GEORGE B. VAUGHAN.
A new depressor design. Limnol. Oceanogr. 11(1): 130–135.

GREEN, ROGER E.
Balloons for marine observations. Sea Frontiers 12(3): 130–137.

GRINOLS, RICHARD B.
Addition of adult anglerfish, *Chaenophryne parviconus* Regan and Trewavas (Pisces: Oneirodidae), to the eastern subarctic Pacific Ocean. Calif. Fish Game 52(3): 161–165.

Northeastern Pacific records of *Anoplogaster cornuta* Valenciennes (Anoplogasteridae: Pisces) and *Cyema atrum* Günther (Cyemidae: Pisces). J. Fish. Res. Bd. Can. 23(2): 305–307.

Northern records of the zoarcid, *Melanostigma pammelas*, in the eastern subarctic Pacific region. Copeia 1966(3): 601–602.

Southern occurrence of *Acantholiparis opercularis* Gilbert and Burke in the eastern subarctic Pacific region. J. Fish. Res. Bd. Can. 23(6): 935–937.

GRINOLS, RICHARD B., AND DAVID W. GREENFIELD.
New records of *Cataetyx rubrirostris* Gilbert from the northeastern Pacific Ocean. Calif. Fish Game 52(3): 211–213.

GRINOLS, RICHARD B., AND J. O. HOOVER.
A record of *Diretmus argenteus* Johnson (Pisces: Diretmidae) from the northeastern Pacific Ocean. Wash. Dep. Fish., Fish. Res. Pap. 2(4): 67–74.

GRONINGER, HERMAN S., JR., AND M. K. EKLUND.
Characteristics of a proteinase of a trichosporon species isolated from Dungeness crab meat. Appl. Microbiol. 14(1): 110–114.

GUTHERZ, ELMER J.
Revision of the flounder genus *Ancylopsetta* (Heterosomata: Bothidae) with descriptions of two new species from the Antilles and the Caribbean Sea. Bull. Mar. Sci. 16(3): 445–479.

GUTHRIE, JAMES F.
The channel net for shrimp in North Carolina. Com. Fish. Rev. 28(11): 24–27.

GUTKNECHT, JOHN.
Sodium, potassium, and chloride transport and membrane potentials in *Valonia ventricosa*. Biol. Bull. (Woods Hole, Mass.) 130(3): 331–344.

HANKS, ROBERT W.
Observations on "milky water" in Chesapeake Bay. Chesapeake Sci. 7(3): 175–176.

HASKIN, H. L., L. A. STAUBER, AND J. A. MACKIN.
Minchinia nelsoni n. sp. (Haplosporida: Haplosporidiidae): causative agent of the Delaware Bay oyster epizootic. Science 153(3727): 1414–1416.

HEARD, WILLIAM R.
Observations on lampreys in the Naknek River system of southwest Alaska. Copeia 1966(2): 332–339.

HEARD, WILLIAM R., AND WILBUR L. HARTMAN.
Pygmy whitefish *Prosopium coulteri* in the Naknek River system of southwest Alaska. U.S. Fish Wildl. Serv., Fish. Bull. 65: 555–579.

HELLE, JOHN H.
Behavior of displaced adult pink salmon. Trans. Amer. Fish. Soc. 95(2): 188–195.

HESTER, FRANK J.
Man in the sea and fisheries of the future. Trans. 2d Annu. MTS Conf. Exhib. June 27–29, 1966—Exploiting the Ocean—Mar. Technol. Soc. (Washington, D.C.): 524–529.

HIDA, THOMAS S.
Catches of bigeye and yellowfin tunas in the Hawaiian longline fishery. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 161–167.

HIDA, T. S., AND W. T. PEREYRA.
Results of bottom trawling in Indian seas by R/V *Anton Bruun* in 1963. Proc. Indo-Pac. Fish. Counc., 11th Sess., sect. 2: 156–165.

HIDU, HERBERT, AND HASKELL S. TUBIASH.
A bacterial basis for the growth of antibiotic-treated bivalve larvae. Proc. Nat. Shellfish. Ass. 54: 25–39.

HIGGINS, BRUCE E.
Sizes of albacore and bigeye, yellowfin, and skipjack tunas in the major fisheries of the Pacific Ocean. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 169–195.

HIGH, WILLIAM L.
Recent captures of the California pompano *(Palometa simillima)* and the sandfish *(Trichodon trichodon)* in Puget Sound. Wash. Dep. Fish., Fish. Res. Pap. 2(4) : 53–54.

HIGH, WILLIAM L., AND LARRY D. LUSZ.
Underwater observations on fish in an off-bottom trawl. J. Fish. Res. Bd. Can. 23(1) : 153–154.

HIGH, WILLIAM W.
Equipment Note No. 19—Trawl cod-end closing device. Com. Fish. Rev. 28(3) : 16–17.

HIGHAM, JOSEPH R., JR.
Preparation of dart tags for use in the field. Progr. Fish-Cult. 28(4) : 205.

HILE, RALPH.
U.S. Federal research on fisheries and limnology in the Great Lakes through 1964: an annotated bibliography. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 528, iii + 53 p.

HIRSCHHORN, GEORGE.
Effect of growth pattern and exploitation features on yields of pink salmon in the Northwestern North Pacific. Trans. Amer. Fish. Soc. 95(1) : 39–51.

HOFFMAN, ETHELWYN G., AND ROBERT M. YANCEY.
Ellobiopsidae of Alaskan coastal waters. Pac. Sci. 20(1) : 70–78.

HOLLAND, H. T., DAVID L. COPPAGE, AND PHILIP A. BUTLER.
Increased sensitivity to pesticides in sheepshead minnows. Trans. Amer. Fish. Soc. 95(1) : 110–112.

HOLLAND, H. T., AND JACK I. LOWE.
Malathion: chronic effects on estuarine fish. Mosquito News 26(3) : 383–385.

HOLSTON, JOHN A.
Research in review. Fish. Gaz. 83(8) : 12, 27; (10) : 8, 23; (12) : 8, 26; (13) : 11–12.

HOSS, DONALD E.
The use of activation analysis methods for tagging post-larval fish. [Abstract.] ASB Bull. 13(2) : 37.

HOWELL, JOHN H.
The life cycle of the sea lamprey and a toxicological approach to its control. *In* Phylogeny of immunity: 263–270. Univ. Fla. Press, Gainesville, Fla.

HUNTER, JOHN R.
Light and schooling behavior of juvenile jack mackerel, *Trachurus symmetricus* (Ayres). [Abstract.] Amer. Zool. 6(4) : 503.

Procedure for analysis of schooling behavior. J. Fish. Res. Bd. Can. 23(4) : 547–562.

HUNTER, JOHN R., DONALD C. AASTED, AND CHARLES T. MITCHELL.
Design and use of a miniature purse seine. Progr. Fish-Cult. 28(3): 175–179.

HUNTER, JOHN R., AND CHARLES T. MITCHELL.
Live coloration of a juvenile *Uraspis secunda* (Poey) from the eastern tropical Pacific. Calif. Fish Game 52(1): 57–58.

INGLIS, ANTHONY, AND EDWARD CHIN.
The bait shrimp industry of the Gulf of Mexico. U.S. Fish Wildl. Serv., Fish. Leafl. 582, iii + 10 p.

IVERSEN, ROBERT T. B.
Hearing in tunas with special reference to *Euthynnus yaito* Kishinouye. [Abstract.] Abstracts of Papers Related with Fisheries, Marine and Freshwater Science, Divisional Meeting on Fisheries Sciences: 25. Proc. 11th Pac. Sci. Congr. 7.

Use of a submarine to record marine biological sounds. [Abstract.] Proc. Hawaii. Acad. Sci., 41st Annu. Meet., 1965–66: 19.

IWAMOTO, TOMIO.
The macrourid fish *Cetonurus globiceps* in the Gulf of Mexico. Copeia 1966(3): 439–442.

JENSEN, ALBERT C.
Life history of the spiny dogfish. U.S. Fish Wildl. Serv., Fish. Bull. 65: 527–554.

JERDE, CHARLES W., AND REUBEN LASKER.
Molting of euphausiid shrimps: shipboard observations. Limnol. Oceanogr. 11(1): 120–124.

JEWETT, STANLEY G., JR.
Notes on *Arcynopteryx (Oroperla) barbara* (Needham) (Plecoptera). Pan-Pac. Entomol. 42(3): 175–177.

Some species of *Capnia* from western North America (Plecoptera). Wasmann J. Biol. 24(1): 101–108.

JOHNSON, LEONARD J., AND RICHARD L. MCNEELY.
Modern technology in commercial fishing. Geo-Mar. Technol. 2(9): 26–30.

JOHNSON, MURRAY L., CLIFFORD H. FISCUS, BURTON T. OSTENSON, AND MYRON L. BARBOUR.
Marine mammals. *In* Norman J. Wilimovsky and John N. Wolfe (editors), Environment of the Cape Thompson Region, Alaska: 877–924. U.S. At. Energy Comm., Div. Tech. Inform., Oak Ridge, Tenn.

JONES, BENJAMIN F.
Two new tools for applying disk tags to fish. Trans. Amer. Fish. Soc. 95(3): 323–325.

JONES, EVERET C.
A new record of *Pseudodiaptomus marinus* Sato (Copepoda, Calanoida) from brackish waters of Hawaii. Crustaceana 10(3): 316–317.

JONES, EVERET C.—Continued.

Use of a submarine to survey populations of planktonic and demersal invertebrates. [Abstract.] Proc. Hawaii. Acad. Sci., 41st Annu. Meet. 1965–66: 18.

JOSSI, JACK W.

The ICITA one-meter plankton net: description and evaluation. Limnol. Oceanogr. 11(4): 640–642.

JOYNER, TIMOTHY, AND JOHN S. FINLEY.

The determination of manganese and iron in sea water by atomic absorption spectrometry. At. Absorption Newslett. 51(1): 4–7.

JUHL, ROLF.

Experimental fish trawling survey along the Florida west coast. Com. Fish. Rev. 28(6): 1–5.

Trends in Gulf of Mexico shrimp trawling fleet. Com. Fish. Rev. 28(12): 43–46.

KAZANAS, N.

Effect of γ-irradiation on the microflora of freshwater fish. II. Generic identification of aerobic bacteria from yellow perch fillets. Appl. Microbiol. 14(6): 957–965.

KAZANAS, N., J. A. EMERSON, H. L. SEAGRAN, AND L. L. KEMPE.

Effect of γ-irradiation on the microflora of freshwater fish. I. Microbial load, lag period, and rate of growth on yellow perch *(Perca flavescens)* fillets. Appl. Microbiol. 14(2): 261–266.

KEILMAN, L. A.

California fisheries, 1965 (preliminary). U.S. Fish Wildl. Serv., Bur. Com. Fish., San Pedro Market News Serv., 24 p.

California fishery products and byproducts brokers, importers, and exporters, 1966 (revised). U.S. Fish Wildl. Serv., Bur. Com. Fish., San Pedro Market News Serv., 15 p.

KELLY, WILLIAM N.

Production of fishery products in selected areas of Maryland, Virginia, and North Carolina, 1965. U.S. Fish Wildl. Serv., Bur. Com. Fish., Hampton Market News Serv., 31 p.

KEYES, MARK C.

Immobilizing, tranquilizing, and anesthetizing drugs used on fur seals *(Callorhinus ursinus)*. Conf. Biol. Sonar Diving Mammals, 1966, Stanford Res. Inst., Menlo Park, Calif.: 74–79.

KIFER, ROBERT R., EDGAR P. YOUNG, AND KAM C. LEONG.

Value of menhaden fish meal as a protein supplement to cottonseed meal–corn diets fed to rats. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(2): 13–15.

Value of menhaden fish meal as a protein supplement to meat-and-bone meal–corn diets fed to rats. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(2): 17–24.

Value of menhaden fish meal as a protein supplement in soybean meal–corn diets fed to rats. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(2): 25–28.

KING, FREDERICK J.
Ultracentrifugal analysis of changes in the composition of myofibrillar protein extracts obtained from fresh and frozen cod muscle. J. Food Sci. 31(5): 649–663.

KUMAR, MAHEMDRA, BANGALORE I. SUNDARARAJ, P. V. NARASIMHAN, M. R. N. PRASAD, AND T. A. VENKITASUBRAMANIAN.
Effects of hormones on liver and saccus vasculosus glycogen in *Notopterus notopterus* (Teleostei). Indian J. Exp. Biol. 4(1): 4–6.

KUPFER, GEORGE A., AND WILLIAM G. GORDON.
An evaluation of the air bubble curtain as a barrier to alewives. Com. Fish. Rev. 28(9): 1–9.

KUTKUHN, JOSEPH H.
Bureau of Commercial Fisheries interests in estuarine ecology. Proc. Symp. Estuarine Ecol. Coastal Waters N.C., May 12, 1966, Raleigh: 45–51.

Dynamics of a penaeid shrimp population and management implications. U.S. Fish Wildl. Serv., Fish. Bull. 65: 313–338.

The role of estuaries in the development and perpetuation of commercial shrimp resources. *In* A symposium on estuarine fisheries: 16–36. Amer. Fish. Soc., Spec. Publ. 3.

LANDRUM, B. J.
Bilateral asymmetry in paired meristic characters of Pacific salmon. Pac. Sci. 20(2): 193–202.

LANE, J. PERRY.
Time–temperature tolerance of frozen seafoods. II. Temperature conditions during commercial distribution of frozen fishery products. Food Technol. 20(4): 197–201.

LANE, J. PERRY, WILMA S. HILL, AND ROBERT J. LEARSON.
Identification of species in raw processed fishery products by means of cellulose polyacetate strip electrophoresis. Com. Fish. Rev. 28(3): 10–13.

LASKER, REUBEN.
Feeding, growth, respiration, and carbon utilization of a euphausiid crustacean. J. Fish. Res. Bd. Can. 23(9): 1291–1317.

LEHMAN, L. W., AND E. J. GAUGLITZ, JR.
The preparation of alkyl esters from highly unsaturated triglycerides. II. J. Amer. Oil Chem. Soc. 43(6): 383–384.

LEVIN, ROBERT E., F. MILES SAWYER, AND PAUL G. SCHEURER.
A limited study on the sanitation of fishing trawler holds. J. Milk Food Technol. 29(11): 336–337.

LEWIS, ROBERT M.
Effects of salinity and temperature on survival and development of larval Atlantic menhaden, *Brevoortia tyrannus*. Trans. Amer. Fish. Soc. 95(4): 423–426.

LEWIS, ROBERT M., AND RUPERT R. BONNER, JR.
Fecundity of the striped bass, *Roccus saxatilis* (Walbaum). Trans. Amer. Fish. Soc. 95(3): 328–331.

LINDNER, MILTON J.
What we know about shrimp size and the Tortugas fishery. Proc. Gulf Carib. Fish. Inst., 18th Annu. Sess.: 18–26.

LOOSANOFF, VICTOR L.
Time and intensity of setting of the oyster, *Crassostrea virginica*, in Long Island Sound. Biol. Bull. (Woods Hole, Mass.) 130(2): 211–227.

LOOSANOFF, VICTOR L., HARRY C. DAVIS, AND PAUL E. CHANLEY.
Dimensions and shapes of larvae of some marine bivalve mollusks. Malacologia 4(2): 351–435.

LOVE, TRAVIS D., AND MARY H. THOMPSON.
Annual report, Bureau of Commercial Fisheries Technological Laboratory, Pascagoula, Mississippi, fiscal year 1965. U.S. Fish Wildl. Serv., Circ. 251, iv + 25 p.

LUX, FRED E., PAUL E. HAMER, AND JOHN C. POOLE.
Summer flounder . . . the Middle Atlantic flatfish. Atl. States Mar. Fish. Comm., Mar. Resourc. Atl. Coast, Leafl. 6, 4 p.

LUX, FRED E., AND L. R. PORTER, JR.
Length–weight relation of the summer flounder *Paralichthys dentatus* (Linnaeus). U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 531, iii + 5 p.

LYLES, CHARLES H.
Fishery statistics of the United States, 1964. U.S. Fish Wildl. Serv., Stat. Dig. 58, ii + 541 p.

MACGREGOR, JOHN S.
Fecundity of the Pacific hake, *Merluccius productus* (Ayres). Calif. Fish Game 52(2): 111–116.

Synopsis on the biology of the jack mackerel *(Trachurus symmetricus)*. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 526, iii + 16 p.

MAGNUSON, JOHN J.
A comparative study of the function of continuous swimming by scombrid fishes. [Abstract.] Abstracts of Papers Related with Fisheries, Marine and Freshwater Science, Symposium on Biological Studies of Tunas and Sharks in the Pacific Ocean: 15. Proc. 11th Pac. Sci. Congr. 7.

Continuous locomotion in scombrid fishes. [Abstract.] Amer. Zool. 6(4): 503–504.

MAGNUSON, JOHN J., AND JOHN H. PRESCOTT.
Courtship, locomotion, feeding, and miscellaneous behaviour of Pacific bonito *(Sarda chiliensis)*. Anim. Behav. 14(1): 54–67.

MALINS, DONALD C.
Incorporation of palmitic -1-C^{14} acid into the ether-containing lipids of dogfish *(Squalus acanthias)* liver. Biochem. J. 100(2): 31.

MALINS, DONALD C.—Continued.

Recent developments in the thin-layer chromatography of lipids. Progress in the chemistry of fats and other lipids 8 (pt. 3): 301–358. Pergamon Press, London.

The ether-containing lipids of dogfish *(Squalus acanthias)* liver. Biochem. J. 100(2): 31.

MALINS, DONALD C., AND HELMUT K. MANGOLD.

Thin-layer chromatography. *In* Frank D. Welcher (editor), Standard methods of chemical analysis (6th ed.), p. 738–780. D. Van Nostrand Co., New York.

MANAR, THOMAS A.

Central Pacific fishery resources: an introduction. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 1–12.

Progress in 1964–65 at the Bureau of Commercial Fisheries Biological Laboratory, Honolulu. U.S. Fish Wildl. Serv., Circ. 243, ii + 42 p.

Skipjack landings could be doubled; scientists disclose at Hawaii meet. Pac. Fisherman 64(7): 7, 9.

MANAR, THOMAS A. (EDITOR).

Proceedings of the Governor's Conference on Central Pacific Fishery Resources, Honolulu, Feb. 28–Mar. 12, 1966, viii + 266 p.

MARR, JOHN C., AND ALBERT L. TESTER.

Report of the Working Group on Research Program. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 44–50.

MARVIN, KENNETH T., AND RAPHAEL R. PROCTOR, JR.

Comparison of two methods of N-ethylcarbazole carbohydrate analysis. U.S. Fish Wildl. Serv., Fish. Bull. 65: 683–684.

MASON, JAMES E.

The migrant dipper: a trap for downstream-migrating fish. Progr. Fish-Cult. 28(2): 96–102.

MATSUMOTO, WALTER M.

Catch and effort statistics for the eastern Pacific tuna fishery. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 131–146.

Distribution and abundance of tuna larvae in the Pacific Ocean. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 221–230.

Identification of tuna larvae. [Abstract.] Abstracts of Papers Related with Fisheries, Marine and Freshwater Science, Symposium on Biological Studies of Tunas and Sharks in the Pacific Ocean: 2. Proc. 11th Pac. Sci. Congr. 7.

MCHUGH, J. L.

Management of estuarine fisheries. *In* A symposium on estuarine fisheries: 133–154. Amer. Fish. Soc., Spec. Publ. 3.

Organization and administration of fishery research in the United States of America. FAO Conference on Fishery Administration and Services. FAS/Cp/66/11, 39 p.

McKernan, Donald L.
Summary of conference. The future of North American fisheries. *In* The fisheries of North America: 63–72. N. Amer. Fish. Conf. Wash., D.C., Apr. 30–May 5, 1965. U.S. Fish Wildl. Serv., Circ. 250.

The industrial fisheries of tomorrow—charting the course. Com. Fish. Rev. 28(8): 1–4.

McMullin, Leslie D.
List of fishery associations in the United States. U.S. Fish Wildl. Serv., Fish. Leafl. 590, ii + 6 p.

List of fishery associations in the United States. U.S. Fish Wildl. Serv., Fish. Leafl. 598, iii + 4 p.

List of fishery cooperatives in the United States, 1966–67. U.S. Fish Wildl. Serv., Fish. Leafl. 599, v + 14 p.

McNeil, William J.
Distribution of spawning pink salmon in Sashin Creek, Southeastern Alaska, and survival of their progeny. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 538, iii + 12 p.

Effect of the spawning bed environment on reproduction of pink and chum salmon. U.S. Fish Wildl. Serv., Fish. Bull. 65: 495–523.

Mead, Giles W.
Family Aulopidae. Mem. Sears Found. Mar. Res. 1(5): 19–29.

Family Bathypteroidae. Mem. Sears Found. Mar. Res. 1(5): 114–146.

Family Bathysauridae. Mem. Sears Found. Mar. Res. 1(5): 103–113.

Family Chlorophthalmidae. Mem. Sears Found. Mar. Res. 1(5): 162–189.

Family Ipnopidae. Mem. Sears Found. Mar. Res. 1(5): 147–161.

Meehan, William R.
Growth and survival of sockeye salmon introduced into Ruth Lake after removal of resident fish populations. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 532, iii + 18 p.

Mendelsohn, Joseph M., Maynard A. Steinberg, and Charles Merritt, Jr.
Techniques for collecting volatile components from haddock flesh for gas chromatographic analysis. J. Food Sci. 31(3): 389–394.

Menzel, R. W., N. C. Hulings, and R. R. Hathaway.
Oyster abundance in Apalachicola Bay, Florida in relation to biotic associations influenced by salinity and other factors. Gulf Res. Rep. 2(2): 73–96.

Merrill, A. S.
Collecting from navigation buoys. *In* R. Tucker Abbott (editor), How to collect shells—a symposium: 54–55. Amer. Malacol. Un., 1966.

Merrill, Arthur S., and Kenneth J. Boss.
Benthic ecology and faunal change relating to oysters from a deep basin in the lower Patuxent River, Maryland. Proc. Nat. Shellfish. Ass. 56: 81–87.

Merrill, Arthur S., and Hugh R. Porter.
A further note on the distribution of Cymatiidae in the western Atlantic. Nautilus 80(1): 31–32.

MERRILL, ARTHUR S., JULIUS A. POSGAY, AND FRED E. NICHY.
Annual marks on shell and ligament of sea scallop *(Placopecten magellanicus)*. U.S. Fish Wildl. Serv., Fish. Bull. 65: 299–311.

MILLER, DAVID.
The blue whiting, *Micromesistius poutassou*, in the western Atlantic, with notes on its biology. Copeia 1966(2): 301–305.

MILLER, MORTON M., AND VIRGIL J. NORTON.
Manpower in the U.S. fisheries today and a look at future needs, problems. Fish Boat 11(5): 17–20, 48.

MIYAUCHI, D., J. SPINELLI, N. STOLL, G. PELROY, AND M. EKLUND.
Irradiation preservation of Pacific Coast fish and shellfish – IV. Storage life of Dungeness crab meat at 33° F (0.5° C) and 42° F (5.5° C). Int. J. Appl. Radiat. Isotop. 17: 137–144.

MIZUNO, G. R., EVELYN MCMEANS, AND J. R. CHIPAULT.
Odor problems of fish oils. Volatile amines of menhaden oil. J. Agr. Food Chem. 14(3): 229–231.

MOCK, CORNELIUS R.
A new locality record for the lancelet, *Branchiostoma caribaeum* (Sundevall), on the Texas Coast. Tex. J. Sci. 18(1): 90–91.

MOFFETT, JAMES W.
The general biology of the cyclostomes with special reference to the lamprey. *In* Phylogeny of immunity: 255–262. Univ. Fla. Press, Gainesville, Fla.

MONAN, GERALD E.
Aids to fish tattooing. Progr. Fish-Cult. 28(1): 57–59.

MOORE, D. R., AND KENNETH J. BOSS.
Additional records for *Parabornia squillina* (Mollusca; Bivalvia). Nautilus 80(1): 34–35.

MURCHISON, A. EARL, AND JOHN J. MAGNUSON.
Notes on the coloration and behavior of the common dolphin, *Coryphaena hippurus*. Pac. Sci. 20(4): 515–517.

NAKAMURA, EUGENE L.
Fiberglass tanks for transfer of pelagic fishes. Progr. Fish-Cult. 28(1): 60–62.

NAKAMURA, EUGENE L., AND JAMES H. UCHIYAMA.
Length–weight relations of Pacific tunas. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 197–201.

NICHOLS, PAUL R.
Comparative study of juvenile American shad populations by fin ray and scute counts. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 525, iii + 10 p.

The striped bass. U.S. Fish Wildl. Serv., Fish. Leafl. 592, iii + 6 p.

NICHOLS, PAUL R., AND RANDALL P. CHEEK.
Tagging summary of American shad, *Alosa sapidissima* (Wilson) and striped bass, *Roccus saxatilis* (Walbaum), Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., 1950–65. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 539, iii + 8 p.

NICHOLS, PAUL R., AND ROBERT V. MILLER.
American shad . . . a springtime delicacy. Atl. States Mar. Fish. Comm., Mar. Resourc. Atl. Coast, Leafl. 7, 4 p.

NICHOLS, PAUL R., ROBERT V. MILLER, JAMES E. SYKES, AND IRWIN M. ALPERIN.
Striped bass. Atl. States Mar. Fish. Comm., Mar. Resourc. Atl. Coast, Leafl. 8, 4 p.

NICHOLSON, WILLIAM R., AND JOSEPH R. HIGHAM, JR.
Age and size composition of the menhaden catch along the Atlantic Coast of the United States, 1962, with a brief review of the commercial fishery. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 527, iv + 24 p.

NORTON, VIRGIL J., AND MORTON M. MILLER.
An economic study of the Boston large-trawler labor force. U.S. Fish Wildl. Serv., Circ. 248, iii + 54 p.

NOVOTNY, ANTHONY J., AND DIPTIMAN CHAKRAVARTI.
A versatile force-feeding system for experimental use with small fish. Progr. Fish-Cult. 28(2): 108–112.

O'BRIEN, JOHN J., AND HENRY R. MCAVOY.
New England fisheries—annual summary, 1965. U.S. Fish Wildl. Serv., Bur. Com. Fish., Boston Market News Serv., 38 p.

OTSU, TAMIO.
The South Pacific long-line fishery for albacore tuna, 1954–64. Com. Fish. Rev. 28(7): 9–12.

OTSU, TAMIO, AND RAY F. SUMIDA.
An estimate of total catch and effort of the Japanese longline fishery in the Pacific Ocean, 1953–63. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 127–130.

OTSU, TAMIO, AND HOWARD O. YOSHIDA.
Distribution and migration of albacore in the Pacific Ocean. [Abstract.] Abstracts of Papers Related with Fisheries, Marine and Freshwater Science, Symposium on Biological Studies of Tunas and Sharks in the Pacific Ocean: 4. Proc. 11th Pac. Sci. Congr. 7.

OTTO, SARA V., HASKELL S. TUBIASH, AND AARON ROSENFIELD.
Improved destaining tube for use in disk electrophoresis. Chemist-Analyst 55: 93.

OWEN, ROBERT W., JR.
Small-scale, horizontal vortices in the surface layer of the sea. J. Mar. Sci. 24(1): 56–66.

PARISER, E. R., AND O. A. HAMMERLE.
Some cultural and economic limitations on the use of fish as food. Food Technol. 20(5): 61–64.

PARKER, PHILLIP S.
Ocean clam survey off U.S. Middle Atlantic Coast—1963. Com. Fish. Rev. 28(3): 1–9.

PATASHNIK, MAX.
New approaches to quality changes in fresh chilled halibut. Com. Fish. Rev. 28(1): 1–7.

PATTEN, BENJAMIN G., AND CHARLES C. GILLASPIE.
The Bureau of Commercial Fisheries Type IV electrofishing shocker—its characteristics and operation. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 529, iii + 15 p.

PEARSON, ROGER E.
Number of circuli and time of annulus formation on scales of pink salmon *(Oncorhynchus gorbuscha)*. J. Fish. Res. Bd. Can. 23(5): 747–756.

PEASE, NORMAN L., AND PAUL J. KRUSE, JR.
There's no rest for the weary shrimp. Fish. Gaz. 83(3): 14–15, 51–52.

PEIFER, JAMES J.
Hypocholesterolemic effects induced in the rat by specific types of fatty acid unsaturation. J. Nutr. 88(3): 331–358.

PELROY, GRETCHEN A., AND M. W. EKLUND.
Changes in the micro-flora of vacuum-packaged irradiated petrale sole *(Eopsetta jordani)* fillets stored at 0.5 C. Appl. Microbiol. 14(6): 921–927.

PERKINS, HERBERT C., AND BERNARD E. SKUD.
Body proportions and maturity of female lobsters. [Abstract.] Amer. Zool. 6(4): 615.

PETERSON, ALVIN E.
Gill net mesh selection curves for Pacific salmon on the high seas. U.S. Fish Wildl. Serv., Fish. Bull. 65: 381–390.

PETERSON, RICHARD S., AND WILLIAM G. REEDER.
Multiple births in the northern fur seal. Z. Saugetierkunde 31(1): 52–56.

POWER, E. A.
Fisheries. *In* The Americana Annual, 1966: 275. Encyclopedia Americana, New York.

Fisheries. *In* 1966 Britannica Book of the Year: 307–309. Encyclopedia Britannica, Inc., Chicago.

Fisheries. *In* Collier's Encyclopedia Year Book, 1966 ed.: 216–217. Crowell-Collier Publishing Company, New York.

United States. *In* Fisheries Year Book, 1966–67: 53–54. British Continental Trade Press Ltd., London.

PRUTER, A. T.
Commercial fisheries of the Columbia River and adjacent ocean waters. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(3): 17–68.

PRUTER, ALONZO T., AND RICHARD SHOMURA.
International cooperation in the Indian Ocean. Nautilus 1: 7–8. Published by J. R. Geigy, S. A., Basle.

RATHJEN, WARREN F., AND MITSUO YESAKI.
Alaska shrimp explorations, 1962–64. Com. Fish. Rev. 28(4): 1–14.

REED, ROGER J.
Some effects of DDT on the ecology of salmon streams in Southeastern Alaska. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 542, iii + 15 p.

REIGLE, NORMAN J., JR.
Trawl cod-end mesh size selectivity toward yellow perch in Lake Erie. Com. Fish. Rev. 28(2): 1–5.

REINTJES, JOHN W., AND ANTHONY L. PACHECO.
The relation of menhaden to estuaries. *In* A symposium on estuarine fisheries: 50–58. Amer. Fish. Soc., Spec. Publ. 3.

RICE, T. R.
Restoring the quality of our environment: What needs to be done and how we are doing it, by John L. Buckley (symposium); comments on. ASB Bull. 13(3): 58–60.

RICHARDS, WILLIAM J.
Paraliparis wilsoni, a new liparid fish from the Gulf of Guinea. Proc. Biol. Soc. (Washington, D.C.) 79: 171–174.

Systematics of the percid fishes of the *Etheostoma thalassinum* species group with comments on the subgenus *Etheostoma*. Copeia 1966(4): 823–838.

RIDGWAY, GEORGE J., HAROLD O. HODGINS, AND GEORGE W. KLONTZ.
The immune response in teleosts. *In* Phylogeny of immunity: 199–207. Univ. Fla. Press, Gainesville, Fla.

RINGLE, DAVID A., BETTY L. HERNDON, AND HARVEY R. BULLIS, JR.
Effects of RES—stimulating lipids and zymosan on shock. Amer. J. Physiol. 210(5): 1041–1047.

RINKEL, M. O., P. SUND, AND G. NEUMANN.
The location of the termination area of the Equatorial Undercurrent in the Gulf of Guinea based on observations during Equalant III. J. Geophys. Res. 71(16): 3893–3901.

RISOLI, T. J.
List of primary receivers of imported fishery products and byproducts at New York 1965 (revised). U.S. Fish Wildl. Serv., Bur. Com. Fish., New York Market News Serv., 23 p.

New York City's wholesale fishery trade, 1965. U.S. Fish Wildl. Serv., Bur. Com. Fish., New York Market News Serv., 37 p.

RIVERS, J. B.
Equipment Note No. 18—A nekton ring net sampler for use aboard oceanographic research vessels. Com. Fish. Rev. 28(2): 9–12.

Gear and technique of the sea bass trap fishery in the Carolinas. Com. Fish. Rev. 28(4): 15–20.

ROBOHM, RICHARD A., AND JOHN T. GRAIKOSKI.
Variables affecting enumeration of bacteria in Lake Michigan waters and sediments. Univ. Mich., Great Lakes Res. Div., Publ. 15: 140–146.

ROCKWELL, JULIUS.
Need for specialized instrumentation pursued by BCF. Data 11(11): 43–47.

RODMAN, DUANE T.
Sound production by the African cichlid *Tilapia mossambica*. Ichthyologica/The Aquarium Journal 38[37](3)[6] June–September 1966: 279–280.

ROE, RICHARD B.
Potentially commercial nephropsids from the western Atlantic. Trans. Amer. Fish. Soc. 95(1): 92–98.

RONSIVALLI, LOUIS J., JULIUS B. BERNSTEINS, AND BURTON L. TINKER.
Method for determining the bacterial permeability of plastic films. Food Technol. 20(8): 98–99.

ROPES, JOHN W.
Pitar morrhuana, new host for *Malacobdella grossa*. Nautilus 79(4): 129–131.

ROPES, JOHN W., AND ARTHUR S. MERRILL.
The burrowing activities of the surf clam. Underwater Natur. 3(4): 11–17.

ROPPEL, ALTON Y., ANCEL M. JOHNSON, RAYMOND E. ANAS, AND DOUGLAS G. CHAPMAN.
Fur seal investigations, Pribilof Islands, Alaska, 1965. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 536, v + 45 p.

ROSEN, BARUCH.
Accumulation of organic acids during cold storage of shucked soft clams, *Mya arenaria* (L.), in relation to quality. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(2): 5–11.

ROSENFIELD, AARON, AND C. J. SINDERMANN.
The distribution of "MSX" in Middle Chesapeake Bay. [Abstract.] Proc. Nat. Shellfish. Ass. 56: 6.

ROTHSCHILD, BRIAN J.
Major changes in the temporal–spatial distribution of catch and effort in the Japanese longline fleet. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 91–126.

On assessing the relation between changes in fish abundance and the oceanic environment. [Abstract.] Abstracts of Papers Related with Oceanography, Symposium on Changes in Ocean, Atmosphere and Marine Resources in the Pacific, with their Predictions: 16. Proc. 11th Pac. Sci. Congr. 2.

Preliminary assessment of the yield potential of the skipjack tuna in the central Pacific Ocean. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 251–258.

ROTHSCHILD, BRIAN J.—Continued.

Skipjack tuna *(Katsuwonus pelamis)* resources of the Trust Territory of the Pacific Islands. Com. Fish. Rev. 28(2): 6–8.

ROUBAL, WILLIAM T., AND A. L. TAPPEL.

Damage to proteins, enzymes, and amino acids by peroxidizing lipids. Arch. Biochem. Biophys. 113(1): 5–8.

Polymerization of proteins induced by free-radical lipid peroxidation. Arch. Biochem. Biophys. 113(1): 150–155.

ROUNSEFELL, GEORGE A., AND ALEXANDER DRAGOVICH.

Correlation between oceanographic factors and abundance of the Florida red-tide *(Gymnodinium breve* Davis), 1954–61. Bull. Mar. Sci. 16(3): 404–422.

ROUNSEFELL, GEORGE A., AND WALTER R. NELSON.

Red-tide research summarized to 1964 including an annotated bibliography. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 535, iv + 85 p.

SAMSON, V. J.

Halibut and troll salmon landings and ex-vessel prices for Seattle, Alaska ports and British Columbia, 1966–65. U.S. Fish Wildl. Serv., Bur. Com. Fish., Seattle Market News Serv., 35 p.

Seattle landings, receipts, and value of fishery products, 1965. U.S. Fish Wildl. Serv., Bur. Com. Fish., Seattle Market News Serv., 25 p.

Seattle, Washington, brokers, importers and exporters of fishery products, 1966. U.S. Fish Wildl. Serv., Bur. Com. Fish., Seattle Market News Serv., 7 p.

SANFORD, F. BRUCE.

Detecting erroneous coordination in the scientific article. STWP Rev. 13(4): 8–10.

SAWYER, THOMAS K.

Observations on the taxonomic status of amoeboid organisms from the American oyster, *Crassostrea virginica.* [Abstract.] J. Protozool. 13 (Suppl.): 23.

SAWYER, T. K., E. F. RUBIN, AND R. F. JACKSON.

Differentiation of canine microfilariae with brilliant cresyl blue. J. Amer. Vet. Med. Ass. 149: 752.

SAYCE, CLYDE S., AND CHARLES C. LARSON.

Willapa oyster studies—use of the pasture harrow for the cultivation of oysters. Com. Fish. Rev. 28(10): 21–26.

SCHAEFERS, EDWARD A.

Recent worldwide developments in design and equipment of small fishing vessels. Proc. Gulf Carib. Fish. Inst., 18th Annu. Sess.: 42–47.

SCHAEFERS, EDWARD A., AND THOMAS PROSS.

Third Technical Meeting on Fishing Boats. Com. Fish. Rev. 28(8): 5–10.

SCHELSKE, CLAIRE L.

Interests of the Radiobiological Laboratory in estuarine ecology. Proc. Symp. Estuarine Ecol. Coastal Waters N.C., May 12, 1966, Raleigh: 35–44.

The fate of fallout radioactivity in an estuary. Amer. Biol. Teacher 28(5): 373–380.

SCHUMANN, GEORGE O., AND HERBERT C. PERKINS.
A jar for culturing small pelagic marine organisms in running water during shipboard or laboratory studies. J. Cons. 30(2): 171–176.

SECKEL, GUNTER R.
The Trade Wind Zone Oceanography pilot study. [Abstract.] Trans. Amer. Geophys. Un. 47(1): 111–112.

SETTE, OSCAR E.
Ocean environment and fish distribution and abundance. Trans. 2d Annu. MTS Conf. Exhib. June 27–29, 1966—Exploiting the Ocean—Mar. Technol. Soc. (Washington, D.C.): 309–318.

SETTE, O. E., AND BRIAN J. ROTHSCHILD.
Report of the Working Group on Skipjack Tuna. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 17–28.

SETTE, O. E., AND J. F. T. SAUR.
Relating fishery fluctuations and environmental changes. [Abstract.] Proc. 11th Pac. Sci. Congr. 2: 10.

SHAW, WILLIAM N.
Oyster setting in two adjacent tributaries of Chesapeake Bay. [Abstract.] ASB Bull. 13(2): 45.

The growth and mortality of seed oysters *Crassostrea virginica* from Broad Creek, Chesapeake Bay, Maryland, in high and low salinity waters. Proc. Nat. Shellfish. Ass. 56: 59–63.

Wily oysters outwit enemies. Outdoor Calif. 27(11): page 4 of cover.

SHAW, WILLIAM N., AND ARTHUR S. MERRILL.
Setting and growth of the American oyster *Crassostrea virginica* on navigation buoys in the lower Chesapeake Bay. Proc. Nat. Shellfish. Ass. 56: 67–72.

SHELTON, J. M., AND R. D. POLLOCK.
Siltation and egg survival in incubation channels. Trans. Amer. Fish. Soc. 95(2): 183–187.

SHERMAN, KENNETH.
Copepods of Gulf of Maine coastal waters. Maine Field Natur. 22(6): 94–97.

Seasonal and areal distribution of zooplankton in coastal waters of the Gulf of Maine, 1964. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 530, iii + 11 p.

SHOMURA, RICHARD S.
Age and growth studies of four species of tunas in the Pacific Ocean. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 203–219.

The Atlantic tuna fisheries, 1963. Com. Fish. Rev. 28(5): 1–11.

SILLIMAN, RALPH P.

Estimates of yield for Pacific skipjack and bigeye tunas. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 243–249.

Plan for an assessment of abundance and yield of Pacific tunas. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 231–242.

SINDERMANN, C. J.

Diseases of marine fishes. Advances Mar. Biol. 4: 1–89.

Epizootics in oyster populations. Proc. 11th Pac. Sci. Congr. 7: 7.

Larval ecology of the trematode *Cryptocotyle lingua*. *In* Augusto Corradetti (editor), Proc. 1st Int. Congr. Parasitol. 1: 12–13.

Parasites of oysters, *Crassostrea virginica*, from the east coast of North America. *In* Augusto Corradetti (editor), Proc. 1st Int. Congr. Parasitol. 1: 585–586.

SKUD, BERNARD E.

Size composition, sex ratio and maturity of offshore lobsters. [Abstract.] Amer. Zool. 6(3): 362–363.

SLAVIN, J. W., J. T. R. NICKERSON, S. A. GOLDBLITH, L. J. RONSIVALLI, J. D. KAYLOR, AND J. J. LICCIARDELLO.

The quality and wholesomeness of radiation-pasteurized marine products, with particular reference to fish fillets. Food Irradiat. 3(4): 365–381.

SLAVIN, JOSEPH W., LOUIS J. RONSIVALLI, AND JOHN D. KAYLOR.

Radiopasteurization of fishery products. Activities Report (of the Research and Development Associates, U.S. Army Natick Laboratories, Natick, Mass.) 17(2): 120–132.

SMITH, BERNARD R.

Lamprey control and research in the United States. Great Lakes Fish. Comm., Annu. Rep. 1964: 31–45.

SMITH, PRESTON, JR., CAROLINE H. KURTZMAN, AND MARY E. AMBROSE.

Automatic method for the determination of calcium in the presence of magnesium and phosphate ions. Clin. Chem. 12(7): 418–427.

SMITH, STANFORD H.

The tullibee. Minn. Conserv. Volunteer 29(170): 49–50.

SNYDER, DONALD G.

Marine protein concentrate. Trans. 2d Annu. MTS Conf. Exhib. June 27–29, 1966—Exploiting the Ocean—Mar. Technol. Soc. (Washington, D.C.): 530–534.

SPANDORF, AARON HERMAN.

Studies concerned with the amino acid requirements of laying hens, with special reference to methionine. (This thesis submitted to the faculty of the Graduate School of the University of Maryland in partial fulfillment of the requirements for the degree of Dr. of Philosophy. 152 p. Approved February 2, 1966.)

SPARKS, ALBERT K., AND WALTER T. PEREYRA.
Benthic invertebrates of the southeastern Chukchi Sea. *In* Norman J. Wilimovsky and John N. Wolfe (editors), Environment of the Cape Thompson Region, Alaska: 817–838. U.S. At. Energy Comm., Div. Tech. Inform., Oak Ridge, Tenn.

SPINELLI, JOHN, AND BARBARA KEMP.
Rapid measurement of inosine monophosphate and total adenosine nucleotides in fish tissue. J. Agr. Food Chem. 14(2): 176–178.

SPRAGUE, LUCIAN M.
Subpopulation identification of tunas. [Abstract.] Abstracts of Papers Related with Fisheries, Marine and Freshwater Science, Symposium on Biological Studies of Tunas and Sharks in the Pacific Ocean: 19. Proc. 11th Pac. Sci. Congr. 7.

SPRINGER, STEWART.
A review of western Atlantic cat sharks, Scyliorhinidae, with descriptions of a new genus and five new species. U.S. Fish Wildl. Serv., Fish. Bull. 65: 581–624.

SPRINGER, STEWART, AND MARY H. WAGNER.
Galeus piperatus, a new shark of the family Scyliorhinidae from the Gulf of California. Contr. Sci. 110, 9 p.

STANSBY, M. E.
Fish, chemical byproducts. *In* George L. Clark and Gessner G. Hawley (editors), The encyclopedia of chemistry: 425–426. 2d ed. Reinhold Publishing Corporation, New York.

STEINBERG, MAYNARD A.
The atom preserves seafoods. Proc. Gulf Carib. Fish. Inst., 18th Annu. Sess.: 56–63.

STEPHENS, JOHN S., JR., EDMUND S. HOBSON, AND ROBERT K. JOHNSON.
Notes on distribution, behavior, and morphological variation in some chaenopsid fishes from the tropical eastern Pacific, with descriptions of two new species, *Acanthemblemaria castroi* and *Coralliozetus springeri*. Copeia 1966(3): 424–438.

STEVENS, R. W. C., AND GEORGE J. RIDGWAY.
A technique for bleeding chickens from the jugular vein. Poultry Sci. 45(1): 204–205.

STOLTING, WALTER H.
International Labor Organization. Two Conventions on conditions of work in fishing industry approved at International Labor Conference. Com. Fish. Rev. 28(9): 44.

STRASBURG, DONALD W.
Bureau of Commercial Fisheries operations with the submarine *Asherah* and ichthyological results of these operations. [Abstract.] Proc. Hawaii. Acad. Sci., 41st Annu. Meet., 1965–66: 18.

Golem cooperae, a new antennariid fish from Fiji. Copeia 1966(3): 475–477.

New fish records from Hawaii: *Hime*, *Pikea*, and *Omobranchus*. Pac. Sci. 20(1): 91–94.

Observations on the ecology of four apogonid fishes. Pac. Sci. 20(3): 338–341.

STRATY, RICHARD R.
Time of migration and age group structure of sockeye salmon *(Oncorhynchus nerka)* spawning populations in the Naknek River system, Alaska. U.S. Fish Wildl. Serv., Fish. Bull. 65: 461–478.

SUND, PAUL N., AND KENNETH C. CUMMINGS.
Observations of vertical migrations of Chaetognatha in the Gulf of Guinea. Bull. Inst. Fondamental Afr. Noire, ser. A, 28(4): 1322–1331.

SUND, PAUL N., AND HENDRIK GIRIGORIE.
Dolphin impaled on marlin's bill. Sea Frontiers 12(6): 326.

SUNDARARAJ, BANGALORE I., AND SHASHI V. GOSWAMI.
Effects of mammalian hypophysical hormones, placental gonadotrophins, gonadal hormones, and adrenal corticosteroids on ovulation and spawning in hypophysectomized catfish, *Heteropneustes fossilis* (Bloch). J. Exp. Zool. 161(2): 287–296.

"In vitro" production of corticosteroids by luteinizing hormone: a new interpretation of LH-induced ovulation in catfish. 2d Int. Congr. Hormonal Steroids, Milan Excerpta Medica Int. Congr. ser. 111: 368–369.

Ovarian compensatory hypertrophy in catfish, *Heteropneustes fossilis* following unilateral ovariectomy. [Abstract.] Anat. Rec. 154(2): 490.

SUNDARARAJ, BANGALORE I., MAHENDRA KUMAR, P. V. NARASIMHAN, M. R. N. PRASAD, T. A. VENKITASUBRAMANIAN, AND J. MALATHY.
Effects of starvation and glucose administration on carbohydrate metabolism of saccus vasculosus and liver of *Notopterus notopterus* (Teleosti). Indian J. Exp. Biol. 4(1): 1–3.

SUNDARARAJ, BANGALORE I., AND S. K. NAYGAR.
Effect of testosterone and estrogen on the testes and seminal vesicles of hypophysectiomized catfish, *Heteropneustes fossilis*. [Abstract.] Anat. Rec. 154(2): 491.

SYKES, JAMES E., AND JOHN H. FINUCANE.
Occurrence in Tampa Bay, Florida, of immature species dominant in Gulf of Mexico commercial fisheries. U.S. Fish Wildl. Serv., Fish. Bull. 65: 369–379.

TARRANT, ROBERT M., JR.
Threshold of perception of eugenol in juvenile sockeye salmon. Trans. Amer. Fish. Soc. 95(1): 112–115.

TAYLOR, JOHN L.
A Pacific polychaete in southeastern United States. Quart. J. Fla. Acad. Sci. 29(1): 21–26.

THOMPSON, J. R.
The Caridean superfamily Bresilioidea (Decapoda Natantia). A revision and a discussion of its validity and affinities. Crustaceana 11 (pt. 2): 129–140.

THOMPSON, JOHN R., MARY H. THOMPSON, AND SHELBY DRUMMOND.
A method for restoring dried crustacean specimens to taxonomically usable condition. Crustaceana 10(pt. 1): 109.

THOMPSON, MARY H.
Proximate composition of Gulf of Mexico industrial fish. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(2): 29–67.

THOMPSON, MARY H., AND R. N. FARRAGUT.
Amino acid composition of the Chesapeake Bay blue crab *(Callinectes sapidus)*. Comp. Biochem. Physiol. 17(4): 1065–1078.

TINKER, BURTON L., LOUIS J. RONSIVALLI, AND JOSEPH W. SLAVIN.
Suitability of flexible plastics as packaging materials for radiopasteurized seafoods. Food Technol. 20(10): 122–124.

TRAVIS, DONALD R.
Proximate composition of Lake Michigan alewife *(Alosa pseudoharengus)*. U.S. Fish Wildl. Serv., Fish. Ind. Res. 3(2): 1–4.

TRENT, LEE, AND WILLIAM W. HASSLER.
Feeding behavior of adult striped bass, *Roccus saxatilis*, in relation to stages of sexual maturity. Chesapeake Sci. 7(4): 189–192.

TUBIASH, HASKELL S.
Ornamental use of starfishes. U.S. Fish Wildl. Serv., Circ. 253, ii + 3 p.

U.S. FISH AND WILDLIFE SERVICE.
Federal Specification, clams, chilled, fresh, and frozen: shucked. PP–C–401c, February 21, 8 p. Superseding Int. Fed. Spec. PP–C–00401b (INT–FWS), March 14, 1963 and Fed. Spec. PP–C–401a, April 25, 1952. [Copies available from General Services Administration, Washington, D.C. 20407.]

Federal Specification, oysters, fresh (chilled) and frozen: shucked. PP–O–956e, June 29, 10 p. Superseding Int. Fed. Spec. PP–O–00956d (INT–FWS), March 26, 1963 and Fed. Spec. PP–O–956c, June 16, 1952. [Copies available from General Services Administration, Washington, D.C. 20407.]

Specification for canned sardines: Maine. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass. NF–10–66, 9 p. Reproduced for The National Association of State Purchasing Officials, an affiliate organization of The Council of State Governments, 1313 East Sixtieth Street, Chicago, Ill. 60637.

Specification for chilled and frozen pollock fillets. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass. NF–11–66, 8 p. Reproduced for The National Association of State Purchasing Officials, an affiliate organization of The Council of State Governments, 1313 East Sixtieth Street, Chicago, Ill. 60637.

Specification for chilled and frozen shucked clams. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass. NF–13–66, 7 p. Reproduced for The National Association of State Purchasing Officials, an affiliate organization of The Council of State Governments, 1313 East Sixtieth Street, Chicago, Ill. 60637.

U.S. Fish and Wildlife Service—Continued.

Specification for chilled and frozen shucked oysters. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Mass. NF-12-66, 7 p. Reproduced for The National Association of State Purchasing Officials, an affiliate organization of The Council of State Governments, 1313 East Sixtieth Street, Chicago, Ill. 60637.

Uchida, Richard N.

The skipjack tuna fishery in Hawaii. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 147–159.

Utter, Fred M., George J. Ridgway, and James W. Warren.

Serological evidence for inbreeding of Lahontan cutthroat trout, *Salmo clarkii henshawi*, in Summit Lake, Nevada. Calif. Fish Game 52(3): 180–184.

Uzmann, Joseph R., and John Douglas.

Clinostomum marginatum in steelhead trout *(Salmo gairdneri)* and cutthroat trout *(Salmo clarki)* in a western Washington lake. Trans. Amer. Fish. Soc. 95(1): 35–38.

Van Dyke, Craig.

Oceanographic observations south of Adak Island, summer 1963. U.S. Fish Wildl. Serv., Data Rep. 12, 1 microfiche (iii + 56 p.).

Vaux, Walter G.

Prediction and control of stream to bed interchange in a salmon spawning stream. *In* Eleanor G. Viereck (editor), Science in Alaska, 1965: 28–29. Proc. 16th Alaskan Sci. Conf., Juneau, Alaska, Aug. 29–Sept. 1, 1965.

Volz, Charles D., and Chester O. Wheeler.

A portable fish-tattooing device. Progr. Fish-Cult. 28(1): 54–56.

Vrooman, Andrew M., Pedro A. Paloma, and Rómulo Jordán.

Experimental tagging of the northern anchovy, *Engraulis mordax*. Calif. Fish Game 52(4): 228–239.

Wagner, Mary Hayes.

Shark fishing gear: a historical review. U.S. Fish Wildl. Serv., Circ. 238, iii + 14 p.

Walker, Gene.

A "new look" for Bay area fish plants. Pac. Fisherman 64(3): 19–20.

Waller, David W.

Phonations of free-ranging spotted porpoises in the eastern Pacific. (Motion picture). [Abstract.] Amer. Zool. 6(4): 516.

Webb, R. D., and R. E. Noble.

A device for randomly sampling juvenile fish populations. Wash. Dep. Fish., Fish. Res. Pap. 2(4): 94–103.

WECKEL, K. G., AND DUANE WOSJE.
Brine salting of Great Lakes chub *(Leucichthys hoyi)* for smoking. Univ. Wis., Coll. Ag. Ext. Serv., Res. Rep. 24, 12 p.

WELCH, WALTER R.
The European oyster, *Ostrea edulis*, in Maine. Proc. Nat. Shellfish. Ass. 54: 7–23.

WELLS, LARUE.
Seasonal and depth distribution of larval bloaters *(Coregonus hoyi)* in southeastern Lake Michigan. Trans. Amer. Fish. Soc. 95(4): 388–396.

WHITE, JOHN C., JR., AND JOSEPH W. ANGELOVIC.
Tolerances of several marine species to Co 60 irradiation. Chesapeake Sci. 7(1): 36–39.

WHITNEY, R.
Increasing the utility of supersaline waters by the introduction of species. [Abstract.] Bull. Ecol. Soc. Amer. 47(3): 126.

WIGLEY, ROLAND L.
New records of *Cadulus* (Scaphopoda) from the New England area. Nautilus 79(3): 90–96.
Rare fossils dredged off Atlantic Coast. Com. Fish. Rev. 28(11): 28–32.
Two new marine amphipods from Massachusetts, U.S.A. Crustaceana 10(pt. 3): 259–270.

WIGLEY, ROLAND L., AND PAUL SHAVE.
Caprella grahami, a new species of caprellid (Crustacea: Amphipoda) commensal with starfishes. Biol. Bull. (Woods Hole, Mass.) 130(2): 289–296.

WILLIAMS, RICHARD B.
Annual phytoplanktonic production in a system of shallow temperate estuaries. *In* Harold Barnes (editor), Some contemporary studies in marine science: 699–716. G. Allen, London.

WILLIAMS, RICHARD B., AND JOHN P. BAPTIST.
Physiology of *Mnemiopsis* in relation to its role as a predator. [Abstract.] ASB Bull. 13(2): 48–49.

WILLIAMS, R. B., AND M. B. MURDOCH.
Annual production of *Spartina* and *Juncus* in North Carolina salt marshes. [Abstract.] Bull. Ecol. Soc. Amer. 47(3): 114.
Annual production of *Spartina alterniflora* and *Juncus roemerianus* in salt marshes near Beaufort, North Carolina. [Abstract.] ASB Bull. 13(2): 49.
Phytoplankton production and chlorophyll concentration in the Beaufort Channel, North Carolina. Limnol. Oceanogr. 11(1): 73–82.

WOLFE, D. A.
Lipid-soluble pigments, vitamins, and prostaglandins. *In* H. C. Damm (editor), Handbook of biochemistry and biophysics: 226–261. World Publishing Co., Cleveland, Ohio.

WOLFE, DOUGLAS A., AND TWYLA A. MINER.
Trace analysis of copper, manganese, and zinc in oyster shells by atomic absorption spectrophotometry. [Abstract.] Amer. Chem. Soc., 18th Annu. SE. Reg. Meeting: A12.

WOLFE, DOUGLAS A., AND THEODORE R. RICE.
Nutrient elements in seawater. *In* Philip L. Altman and Dorothy S. Dittmer (editors), Environmental biology: 511–521. Fed. Amer. Soc. Exp. Biol., Bethesda, Md.

WOLFE, D. A., AND C. L. SCHELSKE.
Counting efficiencies for carbon–14 in marine productivity measurements. [Abstract.] Bull. Ecol. Soc. Amer. 47(3): 133–134.

WOLFERT, DAVID R.
Food of young–of–the–year walleyes in Lake Erie. U.S. Fish Wildl. Serv., Fish. Bull. 65: 489–494.

WOOD, BOBBY J.
Elution of dieldrin and endrin from Florisil. J. Ass. Anal. Chem. 49: 472–473.

WYDOSKI, RICHARD S., AND EDWIN L. COOPER.
Maturation and fecundity of brook trout from infertile streams. J. Fish. Res. Bd. Can. 23(5): 623–649.

YANCEY, ROBERT M.
Review of oyster culture in Alaska 1910–1961. Proc. Nat. Shellfish. Ass. 56: 65–66.

YOSHIDA, HOWARD O.
Skipjack tuna spawning in the Marquesas Islands and Tuamotu Archipelago. U.S. Fish Wildl. Serv., Fish. Bull. 65: 479–488.

Tuna fishing vessels, gear, and techniques in the Pacific Ocean. *In* Thomas A. Manar (editor), Proc. Gov. Conf. Cent. Pac. Fish. Resourc., Honolulu, Feb. 28–Mar. 12, 1966: 67–89.

YUEN, HEENY S. H.
Swimming speeds of yellowfin and skipjack tuna. Trans. Amer. Fish. Soc. 95(2): 203–209.

ZEIN–ELDIN, ZOULA P., AND GEORGE W. GRIFFITH.
The effect of temperature upon the growth of laboratory–held post-larval *Penaeus aztecus*. Biol. Bull. (Woods Hole, Mass.) 131(1): 186–196.

ZIMMER, PAUL D., AND JOHN H. BROUGHTON.
Annual fish passage report – Rock Island Dam, Columbia River, Washington, 1965. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Fish. 533, iii + 24 p.

M.S. 1687.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1968 O - 290-589

Created in 1849, the Department of the Interior--a department of conservation--is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES
WASHINGTON, D.C. 20240

OFFICIAL BUSINESS

Return this sheet to above address, if you d
NOT wish to receive this material ☐, or
change of address is needed ☐ (indica
change including ZIP Code).

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR

Regional Director
Bur. of Commercial Fisheries
P. O. Box 3830
Honolulu, Hawaii 96812

FL C